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LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

PUBLICATIONS ISSUED BY THE COMMITTEE OF LLOYD'S REGISTER.

LLOYD'S REGISTER OF SHIPPING, issued annually on the 1st of July. This Book contains the Names, CLASSES, and detailed information concerning the Vessels classed by Lloyd's Register and the late Underwriters' Registry for Iron Vessels; and in addition, as far as possible, particulars of all SEA-GOING VESSELS in the world, and of all iron and steel vessels trading on the North American Lakes of 100 tons and upwards.

In the Appendix will be found a list of Owners of Ships recorded in the Register Book; details of the Dry and Wet Docks, Floating Docks, Pontoons, Patent Slipways, Tidal Harbours, Quays, &c., at all Ports in the World; a list of Telegraphic Addresses of all firms, &c., connected with Shipping (with the Telegraphic Codes severally employed), so far as ascertained; a list of Steamers arranged according to their gross tonnages; detailed Statistics respecting Merchant Shipping; particulars of the WAR VESSELS BELONGING TO ALL NATIONS, &c., &c.

A list is also printed in the Appendix of the Members and Subscribers of Lloyd's, and of the Agents to Lloyd's.

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ESTABLISHED 1834

(United with the Underwriters' Registry for Iron Vessels in 1885).

RULES & REGULATIONS

FOR THE

CONSTRUCTION AND CLASSIFICATION OF VESSELS.

From 1st July, 1894, to the 30th June, 1895.

OFFICE:—2, WHITE LION COURT, CORNHILL, LONDON.

1894.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

UNITED WITH THE

UNDERWRITERS' REGISTRY FOR IRON VESSELS IN 1885.

ESTABLISHED 1834.

NOTICE.

The Register, which is printed solely for the use of Subscribers, now contains the respective characters and full particulars of Vessels which are classed by Lloyd's Register of British and Foreign Shipping, and of those which are classed by the late Underwriters' Registry for Iron Vessels.

It also includes as far as possible, the Names, Dimensions, and other useful particulars of all other Merchant Vessels of the World, of 100 tons and upwards, some of which, although not classed in this Society's Register, are classed elsewhere.

The conditions regulating the Classification of Vessels in the Register are contained in the Rules.

The Key to the Register precedes the List of Steamers.

September, 1885.

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6. Holland.
7. Belgium.
8. France.
9. Spain and Portugal.
10. Gibraltar.
11. Italy and Austria.
12. Malta.
13. Greece, Turkey, Turkey in Asia, and Roumania.
14. British North America.
15. Newfoundland.
16. United States.
17. South America.
18. North Africa.
19. Egypt and Red Sea Ports.
20. South Africa.
21. Mauritius.
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MARSEILLES	*Ship and Engineer Surveyor* (*Address 8, Rue Beauvau*)	Francis Westerman
NANTES	*Ship and Engineer Surveyor* (*Address 8, Rue de Bréa*)	L.L.L. Olivier
ST. MALO	*with a District extending from Brest to Cherbourg, inclusive Ship and Engineer Surveyor* (*Address, 12, Rue d'Asfeld;* TELEGRAMS, *Gallais*)	Jean Gallais

*Mr. Wilkinson is exclusively an Officer of Lloyd's Register.

9. SPAIN AND PORTUGAL.

BARCELONA		
BILBAO	... (*Address, Muelle de Ripa, 1;* TELEGRAMS, *Lloyds*)	German De Bareno
CADIZ	*Ship and Engineer Surveyor* (*Office, 5, Alameda de Apodaca*)	*T. L. Gray
CARTHAGENA	*Ship and Engineer Surveyor*	R. Perez y Ros
HUELVA	*Ship and Engineer Surveyor* (TELEGRAMS, *Langdon*)	William Langdon
LISBON	*Ship and Engineer Surveyor* ... ... (*Address, Largo do Chafariz de Dentro, 19, 2°;* TELEGRAMS, *Westwood*)	J. Westwood
MALAGA	*Ship and Engineer Surveyor* ... (TELEGRAMS, *Lappe*)	Enrique Lappe
OPORTO	*Ship and Engineer Surveyor* ... ... (*Office, 55, Rua da Rebobeira;* TELEGRAMS, *Ennor*)	Charles J. Ennor

* Mr. Gray is exclusively an Officer of Lloyd's Register.

10. GIBRALTAR.

GIBRALTAR	*Ship and Engineer Surveyor* ... ... (*Address, Naval Yard, Gibraltar;* TELEGRAMS, *Yard*)	J. H. Gilbert

11. ITALY AND AUSTRIA.

ANCONA	... ... (TELEGRAMS, *Devon*)	F. G. Emett
GENOA	... ... (*Office, Via St. Luca No. 2, Prima Scala;* TELEGRAMS, *Schiaffino, Surveyor*)	Francesco Schiaffino
	Engineer Surveyor for Genoa and Leghorn ... ... (*Address, 8, Rue Beauvau, Marseilles*)	Francis Westerman
LEGHORN	... ...	Amerigo Gori
NAPLES	*Ship and Engineer Surveyor* (*Residing at Torre Annunciata, near Naples*)	Francesco Ducoster
TRIESTE	*with district of the Austro-Hungarian Coast* ... ... (*Office, Via Carradori, No. 1, Trieste;* TELEGRAMS, *Florio*)	Elias Florio
	Engineer Surveyor for Trieste District (TELEGRAMS, *Schnabl*)	Frederick Schnabl
	Assistant Ship Surveyor at Fiume for Wood Ships ...	Ignazio Bonetich
	Assistant Engineer Surveyor, also Assistant Ship Surveyor for Iron and Steel Vessels (TELEGRAMS, *Schnabl, Fiume*)	Anthony Schnabl
	Assistant Surveyor at Lussino ...(TELEGRAMS, *Simina*)	Antonio E. Tarrabocchia

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

12. MALTA.

MALTA	*Ship and Engineer Surveyor* ...	(TELEGRAMS, *Register*)	C. H. Wright

13. GREECE, TURKEY, TURKEY IN ASIA, AND ROUMANIA.

CONSTANTINOPLE		(TELEGRAMS, *Woods*)	Admiral Woods Pasha
	Engineer Surveyor	(TELEGRAMS, *Warren*)	G. R. Warren
GALATZ AND BRAILA	... (*residing at Braila*;	TELEGRAMS, *Archbold*)	T. H. Archbold
PIRÆUS ...	*Ship and Engineer Surveyor* ...	(TELEGRAMS, *Graham*)	D. Graham

14. BRITISH NORTH AMERICA.

HALIFAX, N.S.		(TELEGRAMS, *Huntcom*)	David Hunter
MONTREAL		(*Address, Port Warden's Office*)	Archibald Reid
PRINCE EDWARD ISLAND		(*residing at Charlotte Town*; TELEGRAMS, *Register, Charlotte Town*)	H. P. Welsh
QUEBEC	*and the River St. Lawrence*		P. D. Brunelle
TORONTO		(TELEGRAMS, *Harbottle*)	Thomas Harbottle
VANCOUVER ISLAND	(*Address, Victoria, B.C.*;	TELEGRAMS, *Clarke*)	W. R. Clarke

15. NEWFOUNDLAND.

NEWFOUNDLAND	(*Address*, 124, *Water Street, St. John's*)		* George Wheatley

* Mr. Wheatley is exclusively an Officer of Lloyd's Register.

16. UNITED STATES.

NEW YORK	*Principal Surveyor for the United States, and Surveyor for the Port and District of New York*... (*Office, Kemble Buildings, Whitehall Street, New York*;	TELEGRAMS, *Nymdible*)	* Thomas Congdon
	Ship and Engineer Surveyor		* J. H. Mancor

* Mr. Congdon and Mr. Mancor are exclusively Officers of Lloyd's Register.

BALTIMORE	(*Office, 11, South Gay Street*;	TELEGRAMS, *Hoyle*)	Edward H. Sanford
BOSTON	*Ship and Engineer Surveyor*	(TELEGRAMS, *Olshaw*)	Oliver L. Shaw
NEW ORLEANS	(*Address, care of Messrs. Marshall J. Smith & Co.*, 64, *Baronne Street*;	TELEGRAMS, *Turley*)	J. K. Turley
PHILADELPHIA	*Ship and Engineer Surveyor* ... ... (*Office*, 206, *Walnut Place*;	TELEGRAMS, *Haug*)	John Haug
PORTLAND, OREGON...		(TELEGRAMS, *Pope*)	George Pope
SAN FRANCISCO	(*Address*, 304, *California Street*;	TELEGRAMS, *Freeboard, San Frisco*)	John Metcalfe

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

17. SOUTH AMERICA.

BUENOS AYRES	... ...	
DEMERARA	... (*residing at Georgetown*; TELEGRAMS, *Heliostat*)	Alexander Duncan
MONTE VIDEO	(*Address, care of Messrs. Carlisle, Smith & Co., 29, Calle Rincon*; TELEGRAMS, *Crocker*)	F. Crocker
RIO DE JANEIRO	*Ship and Engineer Surveyor* ... ... (*Address, P.O. Box 906*)	E. C. Farley
VALPARAISO	*Ship and Engineer Surveyor* (*Address, Casilla, No. 4*; TELEGRAMS, *Ivol*)	C. C. Ivol

18. NORTH AFRICA.

ALGIERS, ORAN, AND CONSTANTINE	(*residing at Algiers*; TELEGRAMS, *Burke*)	F. M. Burke

19. EGYPT AND RED SEA PORTS.

ADEN	... ...	
SUEZ	... ... (TELEGRAMS, *Armature*)	A. R. Weston
	Engineer Surveyor ... ... (TELEGRAMS, *Metal*)	J. Campbell

20. SOUTH AFRICA.

CAPE TOWN	... (*Address, Alfred Docks*; TELEGRAMS, *Almutium*)	W. Stephen
PORT NATAL	... ... (TELEGRAMS, *Airth*)	Alexander Airth

21. MAURITIUS.

MAURITIUS	... (*residing at Port Louis*; TELEGRAMS, *Cowin*)	John Cowin

22. INDIA, BURMAH, AND STRAITS SETTLEMENTS.

AKYAB	... ... (TELEGRAMS, *Lloyd's Surveyor*)	G. B. Brown
BOMBAY	... (*Address, Sirdar's Buildings, Hummum Street*)	A. C. Clark
	Engineer Surveyor ... (*Address, Bombay Steam Navigation Company, Frere Road, Bombay*)	James Moir
CALCUTTA	... ... (*Office, 4, Commercial Buildings*; TELEGRAMS, *Surveyor*)	D. McKellar
COLOMBO	... ... (TELEGRAMS, *Donnan*)	J. Donnan
KURRACHEE	*Ship and Engineer Surveyor* (*Address, Persian Gulf Telegraphs, Manora, Kurrachee*; TELEGRAMS, *Hughes*)	J. Hughes
MOULMEIN	*Ship and Engineer Surveyor*	P. Campbell
PENANG	... ...	E. Bradbery
	Engineer Surveyor	J. N. Dick
RANGOON	... ...(TELEGRAMS, *Winter*)	R. R. Winter
SINGAPORE	... ...(TELEGRAMS, *Fittock*)	Charles Fittock
	Engineer Surveyor	Newman Mumford

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

23. EAST INDIAN ARCHIPELAGO.

BATAVIA	... ...	H. S. Visman
CHERIBON	... ... (TELEGRAMS, *Campbell*)	C. Campbell
MANILA	*and Ports in the Philippine Islands*	Daniel Earnshaw
	Ship and Engineer Surveyor	
SOURABAŸA	... ...	B. J. Schipper.

24. CHINA AND JAPAN.

HONG KONG	... ...(TELEGRAMS, *Burnie*)	Edward Burnie
	Engineer Surveyor ... (*Address, Bank Buildings*; TELEGRAMS, *Marine*)	Andrew Johnston
KOBÉ, HIOGO	*Ship and Engineer Surveyor* (TELEGRAMS, *Ellerton*)	James Ellerton
NAGASAKI (*See* KOBÉ)		
SHANGHAI	*Ship and Engineer Surveyor* (TELEGRAMS, *Sonne*)	H. Sonne
YOKOHAMA	... ...(TELEGRAMS, *Efford*)	John J. Efford

25. AUSTRALIA, TASMANIA, AND NEW ZEALAND.

ADELAIDE, S.A.	... ...(*Office, Lipson Street, Port Adelaide*)	J. H. Gibbon
AUCKLAND, N.Z.	... ... (TELEGRAMS, *Replento*)	M. T. Clayton
BRISBANE, QUEENSLAND	... (*Address, Norman Chambers, Creek Street*)	R. S. Taylor
CHRISTCHURCH AND LYTTELTON, N.Z.	... ...	Stewart Willis
DUNEDIN, N.Z.	... ... (TELEGRAMS, *Gunwale*)	W. Thomson
HOBART, TASMANIA	... ...	Donald Macmillan
MELBOURNE, VICTORIA	(*Office, 9, Queen Street*; TELEGRAMS, *Reports*)	William Watson
NAPIER, N.Z.	... ...	A. Davidson
NEWCASTLE, N.S.W.	... .	Thomas Brooks
	Engineer Surveyor	James Rorison
SYDNEY, N.S.W.	*Engineer Surveyor* (*Acting also as Ship Surveyor*) (TELEGRAMS, *Miramar*)	R. Pollock

2, White Lion Court, Cornhill, London.
1894.

LIST OF SURVEYORS OF LLOYD'S REGISTER

(ALPHABETICALLY ARRANGED.)

THE SURVEYORS AT THE PORTS MARKED * ARE EXCLUSIVELY THE OFFICERS OF THE SOCIETY, AND ARE NOT PERMITTED TO ENGAGE IN ANY OTHER BUSINESS OR EMPLOYMENT WHATSOEVER.

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*LONDON (TELEGRAMS, *Committee*)	BENJAMIN MARTELL, ESQ., *Chief Surveyor of Lloyd's Register*	George P. Cooper, *Principal Surveyor for London District.*
	Harry J. Cornish, George Stanbury, Thomas C. Read — *Assistants to Chief Surveyor*	W. Moverly, Chas. H. Jordan, C. Buchanan, James H. Truscott, E. C. Champness, H. W. Dove, Geo. R. Mares, E. J. Tierney, W. L. Gilmour
	JAMES T. MILTON, ESQ., *Chief Engineer Surveyor of Lloyd's Register*	
	William Allison, *Assistant to Chief Engineer Surveyor*	
	Engineer Surveyor, and Ship and Engineer Surveyors	George E. Wilkinson, A. Kidd, E. M. Salmon, R. Elliott, H. A. R. Keene
	Draughtsman	David S. Hunter
	Examiner of Masts, Spars and Rigging	H. J. West
AALBORG (Copenhagen District)	*Assistant Ship Surveyor*	A. H. Jepmond
	Assistant Engineer Surveyor	L. S. Lange
*ABERDEEN	*Ship and Engineer Surveyor* (*Office, 29, Regent Quay*)	G. L. Hindmarsh
ADELAIDE, S. A.	(*Office, Lipson Street, Port Adelaide*)...	J. H. Gibbon
ADEN	... ...	James Bowman
AKYAB	... ... (TELEGRAMS, *Lloyd's Surveyor*)	G. B. Brown
ALGIERS, ORAN, AND CONSTANTINE	... ... (*residing at Algiers;* TELEGRAMS, *Burke*)	F. M. Burke
*AMSTERDAM	*Assistant Ship and Engineer Surveyor, residing at Dusseldorf for Steel Testing duty* ... ... (*Address, Franklinstrasse, No. 30, Dusseldorf*)	J. Meyer
ANCONA	... ... (TELEGRAMS, *Devon*)	F. G. Emett
ANTWERP	(*Surveyors' Office, 27, Rue d'Amsterdam, Antwerp;* TELEGRAMS, *Paasch*)	Heinrich Paasch
	Engineer Surveyor ... (TELEGRAMS, *Demblon*)	Francis Demblon
AUCKLAND, N.Z.	... ... (TELEGRAMS, *Replento*)	M. T. Clayton

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

BALTIMORE	... ... (*Surveyor's Office, 11, South Gay Street;* TELEGRAMS, *Hoyle*)	Edward H. Sanford
*BANGOR	... ... (*Address, 1, Glan Dwr Terrace*)	W. G. Copplestone
BARCELONA	... ...	
*BARROW	*Ship Surveyor*	W. Johnstone
	Engineer Surveyor ... ... (*Office, 8, Strand*)	J. Easthope
*BARRY	*Ship and Engineer Surveyors* ... ... (*Office, Dock Chambers, Barry Dock*)	Wm. J. Darling H. E. Tilston
BATAVIA	... ...	H. S. Visman
BATOUM	... ...	F. A. Mattievich
*BELFAST	... ... (*Office, 53, Waring Street*)	James Turpin
	Ship and Engineer Surveyor	A. L. Jones
BERGEN	*Ship and Engineer Surveyor* (TELEGRAMS, *Hougland*)	E. Hougland
	Assistant Ship and Engineer Surveyor	Ludvig Dahl
*BIDEFORD	... ... (*Residing at Appledore*)	T. Godfree
BILBAO	(*Address, Muelle de Ripa, 1;* TELEGRAMS, *Lloyds*)	German De Bareno
BOMBAY	... (*Address, Sirdar's Buildings, Hummum Street*)	A. C. Clark
	Engineer Surveyor ... ... (*Address, Bombay Steam Navigation Co., Frere Road, Bombay*)	James Moir
BORDEAUX	... ...(*Address,* 16, *Rue Blanc Dutrouille;* TELEGRAMS, *Albert Vandercruyce*)	Albert Vandercruyce
	Engineer Surveyor (TELEGRAMS, *Arthur Donzelle*)	Arthur Donzelle
BOSTON	*Ship and Engineer Surveyor* ... ... (TELEGRAMS, *Olshaw*)	Oliver L. Shaw
BRAILA AND GALATZ	(*Residing at Braila;* TELEGRAMS, *Archbold*)	T. H. Archbold
BREMERHAVEN	*Ship and Engineer Surveyor for Weser District* ... (*Office, Deich, 38;* TELEGRAMS, *Thomsen*)	F. H. T. Thomsen
BRISBANE, QUEENSLAND	... (*Address, Norman Chambers, Creek Street*)	R. S. Taylor
*BRISTOL	*Ship and Engineer Surveyor* ... ... (*Office, 53, Queen's Square*)	Duncan Ritchie
BUENOS AYRES	... ...	
*CADIZ	*Ship and Engineer Surveyor* ... ... (*Office, 5, Alameda de Apodaca*)	T. L. Gray
CALCUTTA	(*Office, 4, Commercial Buildings*; TELEGRAMS, *Surveyor*)	D. McKellar
CAPE TOWN...	... ... (*Address, Alfred Docks;* TELEGRAMS, *Almutium*)	W. Stephen
*CARDIFF	... ...	Andrew K. Hamilton, *Principal Surveyor.*
	(*Office, 128, Bute Street*)	J. G. G. Rule
	Engineer Surveyor and Ship and Engineer Surveyors ...	J. F. Walliker J. E. Taylor W. Sibun J. Pollock

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

CARTHAGENA	*Ship and Engineer Surveyor*	R. Perez y Ros
*CHANNEL ISLANDS	(*Office, 15, Mulcaster St., St. Helier's, Jersey*)	J. F. Picot
CHERIBON	... ... (TELEGRAMS, *Campbell*)	C. Campbell
CHRISTCHURCH, N.Z.	... ...	Stewart Willis
CHRISTIANIA	*Ship and Engineer Surveyor*	Johan Wessel
COLOMBO	... ... (TELEGRAMS, *Donnan*)	J. Donnan
CONSTANTINOPLE	... ... (TELEGRAMS, *Woods*)	Admiral Woods Pasha
	Engineer Surveyor ... (TELEGRAMS, *Warren*)	G. R. Warren
COPENHAGEN	*Ship and Engineer Surveyor* ... ... (*Office, 18, Fredericiagade, K.*; TELEGRAMS, *Krebsof*)	O. F. Krebs
	Assistant Ship and Engineer Surveyor	W. B. Herrmann
CRONSTADT	*Ship and Engineer Surveyor* ... ... (*Address, W.O. 9th Line, No. 24, St. Petersburg*) (TELEGRAMS, *Wessblad, Petersburg*)	A. Wessblad
DANZIG	... ... (*Address, Villa Silvia, Zoppot, per Danzig*)	J. F. Sadewasser
DEMERARA	... (*residing at Georgetown*; TELEGRAMS, *Heliostat*)	Alexander Duncan
*DUBLIN	... ...	W. F. Hooper
*DUNDEE	*Ship Surveyor*	J. Thomson
	Engineer Surveyor ... ... (*Office, Maritime Buildings, East Dock Street*)	Harry Clarke
DUNEDIN, N.Z.	... ... (TELEGRAMS, *Gunwale*)	W. Thomson
DUNKIRK	*Including* CALAIS ... (*Office, 7, Rue des Arbres*) (TELEGRAMS, *Dewulf*)	H. Dewulf
*DUSSELDORF	(*See under* AMSTERDAM).	
*FALMOUTH	(*Surveyors' Office, Pendennis House, Lansdowne Road*)	T. H. Sandry
	Ship and Engineer Surveyor for Falmouth	R. H. Cooper
FIUME (Trieste District)	*Assistant Ship Surveyor for Wood Ships*	Ignazio Bonetich
	Assistant Engineer Surveyor also *Assistant Ship Surveyor for Iron and Steel Vessels* (TELEGRAMS, *Schnabl, Fiume*)	Anthony Schnabl
GALATZ and BRAILA	...(*residing at Braila*; TELEGRAMS, *Archbold*)	T. H. Archbold
GENOA	... ... (*Office, Via S. Luca No. 2, Prima Scala*; TELEGRAMS, *Schiaffino, Surveyor*)	Francesco Schiaffino
	Engineer Surveyor ...(*residing at 8, Rue Beauveau, Marseilles*)	Francis Westerman
GIBRALTAR	*Ship and Engineer Surveyor* (*Address, H.M. Naval Yard*; TELEGRAMS, *Yard*)	J. H. Gilbert
*GLASGOW	... . (*Office, 342, Argyle Street*)	Thomas J. Dodd, *Principal Surveyor.* S. J. P. Thearle Thomas S. Warren Charles Edwards Henry Hand A. Campbell-Holms

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*GLASGOW—*continued.*		
	Principal Engineer Surveyor for Glasgow District ...	James Mollison
	Engineer Surveyors and Ship and Engineer Surveyors	Charles E. Stromeyer John Sanderson C. Cooper R. J. Beveridge J. G. Hunter A. McKeand W. C. Hamilton G. Murdoch T. W. Fish F. L. Sturgeon B. G. Oxford
	Inspectors of Forgings for the Clyde District	W. Hamilton F. Cook
GOTHENBURG	*Ship and Engineer Surveyor* ... ... (*Address, Lazareltsgatan No. 101b*)	Carl Axel Möller
*GREENOCK	... ... (*Offices, Commercial Bank Buildings, 14, Cross-shore Street, Greenock*)	Thomas Phillips, *Principal Surveyor.* T. J. House S. A. G. Nash
	Ship and Engineer Surveyor	Andrew C. Heron
HALIFAX, N.S.	... ... (TELEGRAMS, *Huntcom*)	David Hunter
*HAMBURG	... ... (*Office, Steinhöft, No. 3*; TELEGRAMS, *Dykes, Steinhöft, 3*)	Geo. Dykes
	Engineer Surveyor ... (*Office, Stubbenhuk, No. 20*; TELEGRAMS, *Berendt, Stubbenhuk, 20*)	†M. Berendt
	Assistant Engineer Surveyor	†C. H. Rieck
	† Mr. Berendt and Mr. Rieck are not exclusively the servants of the Society.	
*HARTLEPOOL, AND WEST HARTLEPOOL,	*with Whitby and Scarborough* (*Office, Dock Office Buildings, Victoria Terrace, West Hartlepool*)	Charles Fowling, *Principal Surveyor.* C. E. Burney
	Engineer Surveyor, and Ship and Engineer Surveyors	R. Hirst T. R. Blackie A. R. Paton R. Fowell
*HAVRE	(*Adress, 28, Place de l'Hotel de Ville*; TELEGRAMS, *Wilkinson*)	Henri Wilkinson
HOBART, TASMANIA	... ...	Donald Macmillan
HONG KONG	... ...(TELEGRAMS, *Burnie*)	Edward Burnie
	Engineer Surveyor ... (*Address, Bank Buildings*; TELEGRAMS, *Marine*)	Andrew Johnston
HUELVA	*Ship and Engineer Surveyor* (TELEGRAMS, *Langdon*)	William Langdon
*HULL	(*Office, Bank Chambers, Land of Green Ginger, Hull*)	Robert Williamson
	Ship and Engineer Surveyor	James Innes

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*IPSWICH	... ... (*Address, 35, Lower Orwell Street*)	Ebenezer J. Robertson
KOBÉ, HIOGO	*Ship and Engineer Surveyor* (TELEGRAMS, *Ellerton*)	James Ellerton
KURRACHEE	*Ship and Engineer Surveyor* ... ... (*Address, Persian Gulf Telegraphs, Manora, Kurrachee;* TELEGRAMS, *Hughes*)	J. Hughes
LA ROCHELLE	... ... (*Address, La Pallice, La Rochelle*)	J. F. J. Bidaud
LEGHORN	... ...	Amerigo Gori
*LEITH	... ... (*Office, 56, Constitution Street*)	William Paulsen
	Ship and Engineer Surveyor	M. Ritson
LISBON	*Ship and Engineer Surveyor* ... ... (*Address, Largo do Chafariz de Dentro, 19, 2°;* TELEGRAMS, *Westwood*)	J. Westwood
*LIVERPOOL	(*Office, 12, Oriel Chambers, Water Street;* ... ... TELEGRAMS, *Register*)	William C. Davey, *Secretary and Principal Surveyor.* Edward C. Wheeler J. Dawkins John Rutherford J. Bradley R. T. Johnson
	Engineer Surveyors, and Ship and Engineer Surveyor	Peter McGregor G. A. Milner J. Dykes
LUSSINO (Trieste District)	*Assistant Ship Surveyor* ...(TELEGRAMS, *Simina*)	Antonio E. Tarrabocchia
LYTTELTON, N.Z.	(*See* CHRISTCHURCH, N.Z.)	
MALAGA	*Ship and Engineer Surveyor* (TELEGRAMS, *Lappe*)	Enrique Lappe
MALTA	*Ship and Engineer Surveyor* (TELEGRAMS, *Register*)	C. H. Wright
MANCHESTER (*See* SHEFFIELD).		
MANILA	*Ship and Engineer Surveyor*...	Daniel Earnshaw
MARSEILLES	*Ship and Engineer Surveyor* (*Address, 8, Rue Beauvau*)	Francis Westerman
MAURITIUS	... (*residing at Port Louis;* TELEGRAMS, *Cowin*)	John Cowin
MELBOURNE, VICTORIA	(*Office, 9, Queen Street;* TELEGRAMS, *Reports*)	William Watson
*MIDDLESBOROUGH	*with Stockton* (*Office, Royal Exchange, Middlesborough*)	Jesse Williams, *Principal Surveyor.* A. B. Wilson
	Ship and Engineer Surveyors	W. R. Austin H. H. Ashton W. J. Smith R. Balfour
MILFORD HAVEN	*Pembroke and Tenby, with a district extending as far as Newquay, inclusive* ... ... *Ship and Engineer Surveyor* ... ... (*Address, The Terrace, Neyland, R.S.O., South Wales;* TELEGRAMS, *Harris, Surveyor, New Milford*) ...	W. Harris
MONTE VIDEO	(*Address, care of Messrs. Carlisle, Smith & Co., 29, Calle Rincon;* TELEGRAMS, *Crocker*)	F. Crocker

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

MONTREAL	... ... (*Address, Port Warden's Office*)	Archibald Reid
MOULMEIN	*Ship and Engineer Surveyor*	P. Campbell
NAGASAKI	(*Residing at Kobé, Hiogo;* TELEGRAMS, *Ellerton*)	James Ellerton
NANTES	*Ship and Engineer Surveyor* (*Address, 8, Rue de Bréa*)	L. L. L. Olivier
NAPIER, N.Z.	... ...	A. Davidson
NAPLES	*Ship and Engineer Surveyor* ... (*Residing at Torre Annunciata, near Naples*)	Francesco Ducoster
NEW ORLEANS	(*Address, care of Messrs. Marshall J. Smith & Co., 64, Baronne Street;* TELEGRAMS, *Turley*)... ...	J. K. Turley
*NEW YORK	*Principal Surveyor for the United States* ... ... (*Office, Kemble Buildings, Whitehall Street;* TELEGRAMS, *Nymdible*)	Thomas Congdon
	Ship and Engineer Surveyor	J. H. Mancor
*NEWCASTLE-ON-TYNE	... ... (*Office, 3, St. Nicholas' Buildings*)	Henry J. Boolds, *Principal Surveyor.* James Sibun James McNeil Thomas H. Cooke Thomas Shilston J. W. Scullard Charles Skentelbery
	Engineer Surveyor, and Ship and Engineer Surveyors	J. E. Stoddart G. A. Hake W. Morrison T. Field R. Haig R. F. Morton C. M. B. Dyer A. Boyd F. W. Pitt
	Inspector of Forgings	J. C. Craig
NEWCASTLE, N.S.W.	... ...	Thomas Brooks
	Engineer Surveyor	James Rorison
*NEWFOUNDLAND	... ... (*Address, 124, Water St., St. John's*)	George Wheatley
*NEWPORT, MON.	*Ship and Engineer Surveyor* (*Office, 69, Dock Street*)	J. H. Heck
NORDBY, FANÖ (Copenhagen District)	*Assistant Ship Surveyor*	L. J. Hansen
ODESSA	*Ship and Engineer Surveyor*	J. G. Crookston
OPORTO	*Ship and Engineer Surveyor* ... ... (*Office, 55, Rua da Rebobeira*; TELEGRAMS, *Ennor*)	C. J. Ennor
ORKNEYS	... ... (*residing at Stromness*)	Geo. Gunn Baillie
PENANG	... ...	E. Bradbery
	Engineer Surveyor	J. N. Dick
PHILADELPHIA	*Ship and Engineer Surveyor* ... ... (*Office, 206, Walnut Place*; TELEGRAMS, *Haug*)	John Haug
PIRÆUS	*Ship and Engineer Surveyor* (TELEGRAMS, *Graham*)	D. Graham

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*PLYMOUTH	*Ship and Engineer Surveyor* (*Office, 13, Exchange*)	H. W. Wilkins
PORT NATAL	... ... (TELEGRAMS, *Airth*)	Alexander Airth
PORTLAND, OREGON	... ... (TELEGRAMS, *Pope*)	George Pope
*PORTMADOC	... ...	William John
PRINCE EDWARD ISLAND	(TELEGRAMS, *Register, Charlotte Town; residing at Charlotte Town*)	H. P. Welsh
QUEBEC	... ...	P. D. Brunelle
*QUEENSTOWN	... ...	J. W. Attridge
RAMSGATE	... ...	Edward Jones
RANDERS (Copenhagen District)	*Assistant Ship Surveyor*	Poul F. Petersen
RANGOON	... ...(TELEGRAMS, *Winter*)	R. R. Winter
RIGA	... ... (TELEGRAMS, *Lindemann*)	C. A. Lindemann
	Engineer Surveyor ... ... (*Address, Pychau Dampfsagemühle;* TELEGRAMS, *Hillbring*)	F. W. Hillbring
RIO DE JANEIRO	*Ship & Engineer Surveyor* (*Address, P.O., Box 906*)	E. C. Farley
ROSTOCK	... ... (TELEGRAMS, *Cordes, Surveyor*)	W. Cordes
*ROTTERDAM	*Ship and Engineer Surveyor* (*Address, Vaste Land 16;* TELEGRAMS, *Vanollefen, Vasteland, Rotterdam*)	W. F. D. Van Ollefen
ST. JOHN, N. B.	... ...	
*ST. JOHN'S, N.F.L.	(*Address, 124, Water Street, St. John's*) ...	George Wheatley
ST. MALO	*Ship and Engineer Surveyor* (*Address, 12, Rue d'Asfeld;* TELEGRAMS, *Gallais*)	Jean Gallais
ST. PETERSBURG	*Ship and Engineer Surveyor* ... ... (*Address, W.O., 9th Line, No. 24;* TELEGRAMS, *Wessblad, Petersburg*)	A. Wessblad
SAN FRANCISCO	... ... (*Address, 304, California Street;* TELEGRAMS, *Freeboard, San Frisco*)	John Metcalfe
SEBASTOPOL	*Ship Surveyor*	C. Artsayooloff
	Engineer Surveyor ... ... (*residing at Odessa*)	J. G. Crookston
SHANGHAI	*Ship and Engineer Surveyor* ... (TELEGRAMS, *Sonne*)	H. Sonne
*SHEFFIELD	*for Steel Testing duties in the Midlands, and Ship and Engineer Surveying duties at Manchester* ... (*Office, Buckingham Chambers, St. James St., Sheffield*)	H. P. Cornish J. W. Dimmock
SINGAPORE	... ...(TELEGRAMS, *Fittock*)	Charles Fittock
	Engineer Surveyor	Newman Mumford
SOURABAŸA	... ...	B. J. Schipper
*SOUTHAMPTON	... ... (*Office, 3, Oriental Place*)	James L. Sinnette, *Principal Surveyor*
	Ship and Engineer Surveyor	R. W. Coomber
STOCKHOLM	*Ship and Engineer Surveyor* ... ... (*Address, Skeppsmalningskontoret, 46, Skeppsbron;* TELEGRAMS, *Lloyd's Register*)	Albert Isakson

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

SUEZ	... ... (TELEGRAMS, *Armature*)	A. R. Weston
	Engineer Surveyor ... ... (TELEGRAMS, *Metal*)	J. Campbell
*SUNDERLAND	... ... (*Office, 56, John Street*)	John Lawrence, *Principal Surveyor.* William Bath W. L. Sharpe George Harrison
	Engineer Surveyor, and Ship and Engineer Surveyor	Patrick Salmon J. T. Findlay
	Inspector of Forgings	Hugh Cameron
*SWANSEA	... ... (*Office, 1, Gloster Place*)	
	Ship and Engineer Surveyor	J. Barclay
SYDNEY, N.S.W.	*Engineer Surveyor* (*Acting also as Ship Surveyor*) (TELEGRAMS, *Miramar*)	R. Pollock
TORONTO	... ... (TELEGRAMS, *Harbottle*)	Thomas Harbottle
TRIESTE	(*Office, Via Carradori No. 1, Trieste;* TELEGRAMS, *Florio*)	Elias Florio
	Engineer Surveyor for Trieste District ... ... (TELEGRAMS, *Schnabl*)	Frederick Schnabl
VALPARAISO	*Ship and Engineer Surveyor* (*Address, Casilla, No. 4;* (TELEGRAMS, *Ivol*)	C. C. Ivol
VANCOUVER ISLAND	(*Address, Victoria, B.C.;* TELEGRAMS, *Clarke*)	W. R. Clarke
VEENDAM	... (*Address, Kerklaan H., 785, Veendam;* TELEGRAMS, *Hazewinkel, Expert*)	H. P. Hazewinkel
WATERFORD	*Ship and Engineer Surveyor*	Andrew Horn
WEXFORD	... ...	R. J. Sparrow
*WHITEHAVEN (*See Barrow*)	... ...	
YOKOHAMA	... ...(TELEGRAMS, *Efford*)	John J. Efford

2, WHITE LION COURT, CORNHILL, LONDON.

1894.

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LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

Section 1. The operations of the Societies of the two Register Books of Shipping formerly printed for the use of Merchants, Ship Owners, and Underwriters, having ceased in the year 1834, this Society was then established for the purpose of obtaining a faithful and accurate Classification of the Mercantile Shipping of the United Kingdom, and of the Foreign Vessels trading thereto, and for the government of which the following Rules and Regulations have been from time to time adopted.

Section 2. A Register Book to be printed annually for the use of Subscribers, containing the names of the Ships with other useful information, and the Character assigned, where the vessels are classed by the Society; also the names, &c., of all Ships of 100 tons and upwards unclassed by this Society.

Section 3. Each person subscribing the sum of Three Guineas per annum (or such other sum as the General Committee may fix) to be considered a Member of the Society, and entitled *for his own use* to one copy of the Register Book.

Section 4. The subscription of Marine Insurance Companies, Public Companies or Public Establishments to be Ten Guineas per annum, for which one copy of the Register Book will be supplied. The subscription for all additional copies to be £3 3s. per annum, unless such copies be periodically posted with type with additions and corrections throughout the year, in which case the subscription for each additional copy will be the same as the subscription for the first copy.

Section 5. In the case of other Subscribers the subscription to be £3 3s. per annum for each copy, unless periodically posted with type with additions and corrections throughout the year, in which case the subscription will be £5 5s. per annum for each copy supplied.

Section 6. For the convenience of Subscribers not resident in London, or whose Register Books are not posted, a Supplement, containing the additions to, and corrections made in, the Register Book, to be printed fortnightly, in such convenient form as to admit of its transmission by Post, so that such parties may be furnished, from time to time, with the latest and most complete information.

Section 7. The superintendence of the affairs of the Society to be under the direction of a Committee of Merchants, Shipowners, and Underwriters : twenty-four elected in London and thirty-two at the principal Outports, and in addition, the Chairman, or, in his absence, the Deputy-Chairman of the Corporation of Lloyd's, and the Chairman, or, in his absence, the Deputy-Chairman of the General Shipowners' Society, for the time being, to be, *ex-officio*, Members of the Committee, but any member (except an ex-officio member) who fails to attend any meetings of the Committee for a period of six continuous months, without leave of absence, shall cease to be a member, and his place shall be filled up in the usual way.

NOTE.—*Official intimation to be given in June of each year whether the Chairman or Deputy-Chairman of the Corporation of Lloyd's, or the General Shipowners' Society, respectively, are to be the ex-officio members for the ensuing twelve months.*

Section 8. The General Committee reserve the right of varying or withdrawing the representation of Outports, as well as the mode of election of Members.

Section 9. Six of the Members elected in London, namely, two of each of the constituent parts of the Committee, to go out annually by rotation, but to be eligible to be re-elected. The vacancies so arising to be filled up by the election of two Underwriters and one Merchant by the Committee of Lloyd's, and two Shipowners and one Merchant by the Committee of the General Shipowners' Society.

Section 10. Of the Members elected at the Outports twenty-eight are to retire at the end of every *four* years, and four of the Members elected at Liverpool are to retire annually. The retiring Members are eligible for re-election.

Section 11. The Committee to appoint from their own body, annually, a Chairman and Deputy-Chairman, and also a Chairman for a Sub-Committee of Classification.

Section 12. The Committee to appoint a Sub-Committee of Classification, to be so regulated that each Member of the General Committee may, in rotation, take his turn of duty therein throughout the year.

Section 13. The Secretary, Clerks, and Servants of the Society, and the Surveyors, to be appointed by and be under the direction of the General Committee.

Section 14. Special meetings to be convened by order of the Chairman, or Deputy-Chairman, or on the requisition of any three Members.

Section 15. All elections and appointments to be made by ballot, excepting when in the election of Chairman, Deputy-Chairman, or Chairman of Classification, only one person is nominated for each office.

Section 16. No Member of the Committee to be permitted to be present on the decision of the classification of any ship of which he is the owner, or wherein he is directly or indirectly interested.

Section 17. 1. The Committee to be empowered to make such Bye-laws for their own government and proceedings as they may deem requisite, not being inconsistent with the original Rules and Regulations under which the Society was established ; but no new Rule or Bye-law to be introduced, or any Rule or Bye-law altered, without special notice being given for that purpose at the Meeting of the Committee next preceding that at which such Motion is intended to be made ; such notice to be inserted in the summons convening the meeting.

2. No new Rule, or alteration in any existing Rule, materially affecting the classification of ships, to take effect until the expiration of six months from the time it shall have been determined upon.

Section 18. All Reports of survey to be made in writing by the Surveyors according to the form prescribed, and submitted for the consideration of the General Committee, or of the Sub-Committees of Classification; but the character assigned by the latter to be subject to confirmation by the General Committee.

Section 19. 1. The reports of the Surveyors, and all documents and proceedings relating to the classification of ships are to be carefully preserved and to be open to the inspection of the Owners, but no other person or persons are to have access to such documents except with the written consent of the Owners and under the direction of the Chairman or Deputy-Chairman.

2. Copies of the original reports (if the ships be already classed, but not otherwise), so far as relates to the dimensions, scantlings, fastenings, and materials, in cases where the correctness of the reports in these particulars is certified by the builders, are granted on application.

Section 20. Foreign ships, and ships built in the British possessions abroad where there is not a Surveyor (*see also* Section 52 of the Rules for Wood Vessels), to be surveyed on their arrival at a port to which a Surveyor has been appointed; but a due regard is to be had to the circumstance of such vessels having been exempted from supervision while building, and the Character to be assigned to them is to be regulated according to their intrinsic quality and from the best information the Committee can obtain.

Section 21. In every case in which the Character assigned to a ship may be proposed, on survey, to be reduced, notice is to be given in writing to the Owner, Master, or Agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, on the Owner, Master, or Agent agreeing to pay the expenses attending the same, provided on the said survey there shall appear sufficient ground for the proposed reduction.

Section 22. 1. When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the Owner, Master, or Agent, and if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

2. All repairs of Ships or Machinery required at Ports where there is a Surveyor to this Society, in order to their obtaining a Character in the Register Book, or to their retaining the Characters assigned to them therein, must be carried out under the inspection, and to the satisfaction of the Society's Surveyors. Ships or machinery repaired at Ports where there is no Surveyor to this Society must be surveyed by one of the Society's Surveyors at the earliest opportunity.

Section 23. Parties considering the repairs suggested by the Surveyor to be unnecessary or unreasonable may appeal to the Committee, who will direct a special survey to be held; but should the opinion of the Surveyor be confirmed by the Committee, then the expense of such special survey is to be paid by the party appealing.

Section 24. The Surveyors to the Society not to be permitted (without the especial sanction of the Committee) to receive any fee, gratuity, or reward whatsoever for their own use or benefit, for any service performed by them in their capacity of Surveyors to this Society, on pain of immediate dismissal.

Section 25. The Surveyors will be directed to attend on Special Surveys of ships or machinery while building or under damage or repair, when required by Merchants, Shipowners, or Underwriters; the charge for which is to be regulated according to the nature and extent of the service performed. In all cases, the application for the assistance of the Surveyors must be made in writing addressed to the Secretary.

FUNDS.

Section 26. The Funds to be under the authority and control of the Committee, and a statement of the Receipts and Expenditure to be annually printed for the information of the subscribers.

Section 27. The following Fees to be charged to the Owners of ships prior to their vessels being classed and registered in the book:—

I.

Classing Fees.

For First Entry of Class in the Register Book.

For each Ship under 200 Tons	£1	0 0
Ditto of 200 and under 500 Tons	2	0 0
Ditto of 500 „ 1,000 „	3	0 0
Ditto of 1,000 „ 2,000 „	4	0 0
Ditto of 2,000 and upwards	5	0 0

For First Entry of Notification "LMC" in the Register Book.

For each Ship under 100 registered HP.	£1	0 0
Ditto of 100 and under 300 HP.	2	0 0
Ditto of 300 and above	3	0 0

II.

Office or Registration Fees by the Society's Non-Exclusive Surveyors.

(A.)

Chargeable on Vessels surveyed, for Special Surveys No. 1, No. 2, and No. 3.

For each Ship under 500 Tons	£0	10 0
Ditto of 500 and under 1,000 Tons	1	0 0
Ditto of 1,000 „ 2,000 „	1	10 0
Ditto of 2,000 and upwards	2	0 0

(B.)

For all other Surveys which have to be Reported to the Committee on Official Forms.

For each Ship	£0	10 0

In cases where Surveys are held on the hulls and machinery of vessels, this fee is to be charged only on one of the Surveys.

SPECIAL SURVEYS.

Section 28. 1. For ships built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠), 1s. per ton for the first 1,000 tons, and 6d. per ton for every ton beyond 1,000 tons.

2. For machinery or new boilers built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠ in red) :—

3. For engines and boilers up to 200 registered horse-power, 3 shillings per horse-power. For engines over 200 horse-power, 3 shillings for the first 200 horse-power, and 1 shilling per horse-power above 200. No fee to be less than £8 0s. 0d.

4. The following rule is to be used for determining the Nominal Horse Power of Triple Expansion Engines in regulating the fees for the survey of Engines of that description, viz. :—

$$\frac{1}{2}\left(\frac{D^2 \times \sqrt{S}}{100} + \frac{H}{15}\right) = \text{Nominal H.P. (of Triple Expansion Engines).}$$

where D=diameter of L. P. Cylinder in inches.

S=stroke in inches.

H=heating surface in square feet.

The square feet of heating surface represented by H will comprise the surface of the tubes, of the back tube plate or plates, and of the furnace and combustion chamber plating down to the level of the fire bars.

5. For the survey and testing of Donkey Boilers, a fee of two guineas to be charged.

6. For Surveys for damage, or for other Surveys held at the request of the Owners, and for the Survey of Ships for Restoration, Continuation, or the character A in Red, and for Occasional Surveys and Surveys of repairs by the Society's non-exclusive Surveyors, a charge will be made according to the nature and extent of the service performed.

7. SPECIAL PERIODICAL SURVEYS, Nos. 1, 2, and 3.

For the special periodical surveys of Iron and Steel Vessels, when such surveys are held by the Society's exclusive Surveyors in the United Kingdom.

	S.S. No. 1.	S.S. No. 2.	S.S. No. 3.
	£ s.	£ s.	£ s.
For Vessels under 200 tons gross ...	1 10 ...	2 10 ...	3 10
Ditto „ 300 „ ...	2 10 ...	3 10 ...	4 10
Ditto „ 400 „ ...	3 0 ...	4 0 ...	5 0
Ditto „ 800 „ ...	3 10 ...	4 10 ...	6 0
Ditto „ 1,200 „ ...	4 0 ...	5 0 ...	7 0
Ditto „ 1,800 „ ...	4 10 ...	5 10 ...	8 0
Ditto „ 2,500 „ ...	5 0 ...	6 0 ...	9 0
Ditto „ 3,500 „ ...	5 10 ...	6 10 ...	10 0
Ditto of 3,500 „ and above	6 0 ...	7 0 ...	10 0

SPECIAL PERIODICAL SURVEYS OF MACHINERY.

Held at the Special Surveys, Nos. 1, 2, and 3.

For each Ship under 50 registered HP	£2 10 0
Ditto „ 100 „	3 10 0
Ditto „ 150 „	4 0 0
Ditto „ 200 „	4 10 0
Ditto „ 300 „	5 0 0
Ditto of 300 „ and above	5 10 0

SPECIAL ANNUAL SURVEYS OF BOILERS.

To be held when and after the Boilers are six years old.

For each Ship having 1 boiler	£1	0	0
And for each additional boiler (including the donkey boiler) ...	0	10	0
But the fee in no case to be more than	3	0	0

8. In cases where the caulking of ships is superintended and tested by the Surveyors, a special charge will be made, according to the tonnage of the ship.

9. All repairs which may be required on the Surveys above referred to, must be performed under the superintendence of the Society's Surveyors. (*See also* Section 22.)

MEM.—It is to be understood that in all cases where travelling expenses are incurred by the Surveyors in connection with the above services, they are to be defrayed by the parties interested in the same.

Section 29. Certificates of Character, on the Form No. 7, or of "LMC," or "B&MS," on Forms Nos. 10 or 11, signed by the Chairman, the Deputy-Chairman, or the Chairman of the Sub-Committee of Classification, and countersigned by the Secretary, will be granted on application.

FREEBOARD.

Section 30. Fees for the Survey for, and assignment of, Freeboard to vessels :—

For Classed Vessels under 300 tons gross	£1	1	0
Ditto ditto of 300 tons and under 1000 tons gross	2	2	0
Ditto ditto 1000 „ „ 2000 „	3	3	0
Ditto ditto 2000 „ „ 3000 „	4	4	0
Ditto ditto 3000 „ „ 4000 „	5	5	0
Ditto ditto 4000 and above „	6	6	0

Section 30a. Rules, complete, 10s. each copy. If for Wood Ships and Composite Ships combined, 5s. For Iron and Steel Ships combined, 5s.

LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES FOR IRON VESSELS.

1894–95.

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RULES
FOR
THE BUILDING AND CLASSIFICATION OF IRON VESSELS.

1. **Iron Vessels** will be classed A with a Numeral prefixed, so long as, on careful annual and periodical Special Surveys, they are found to be in a fit and efficient condition for the safe conveyance of dry and perishable cargoes. (*See* N.B. at foot.)

2. 100A, 90A, and 80A, will denote vessels that have been built in accordance with, or equal to the Rules, and Tables G 1 to G 8. Deviations from the Rules will be allowed, provided that a sketch of the midship section, plans, &c., in each case, showing the proposed scantlings and arrangements, be first submitted through the resident Surveyors, and approved by the Committee; and, that the Vessels be built in accordance with the approved plans, under the Survey of the Surveyors of this Society.*

3. Vessels which do not fulfil all the requirements for the 100A class, but which are superior to those built on the 90A scale, may, if the Committee approve, be classed 95A; those not equal to the 90A, but superior to the 80A, may be classed 85A; and those which in some respects are deficient of the requirements of the 80A scale, but fit for the A class, may be classed 75A.

4. At the time of any survey, the comparative numeral will depend on the thickness of the plating and angle iron, and the general condition of the Vessel.†

5. In the cases of vessels intended to load or discharge on the ground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which under the circumstances they will be subjected.

6. Vessels which are built for special purposes, and which are considered fit for such purposes, may be classed A, provided all the details of the scantlings and arrangements be submitted to the Committee for approval.

7. To the class A in such cases will be affixed a designation, showing the particular trade or purpose for which the vessels are intended, thus:—A "For River purposes only." A "For Tug purposes." A "Fishing Smack." A "For Channel purposes," &c.

8. In vessels intended for Channel purposes, the particular Channel is to be defined thus: "Bristol Channel," "Irish Channel," "English Channel," "Newhaven—Dieppe," &c.; and all vessels classed for Channel purposes must have a minimum freeboard, as required in awning-decked vessels, to be submitted for the approval of the Committee.

N.B.—It is to be distinctly understood that the numerals prefixed to the letter A *do not signify terms of years, but are intended for the purpose of comparison only; the* A *character assigned being for an indefinite period, subject to annual and periodical Surveys as hereinafter described.*

* In vessels building, or to be built, under contract for classification, deviations from the Rules will not be allowed by the Committee, unless the Builder shall previously obtain the sanction of the Owner.

† *Expunging or withdrawal of character.—The fifth, sixth, and seventh Columns in the list of Steam Vessels, and the sixth, seventh, and eighth Columns in the list of Sailing Vessels left blank, indicate that the Vessel has never been Classed in the Register Book. Three dots . . . in Column 7 in the list of Steam Vessels, and Column 8 in that of Sailing Vessels, indicate that the vessel was at one time Classed by this Society, but that the Class has been withdrawn at Owner's request. A black line with date under it in Column 5 in the list of Steamers, and Column 6 in the list of Sailing Vessels, indicates that, at that date the Vessel,* from reported defects, *was not entitled to a Character in the Register Book. A red line with date under it in these Columns indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.*

9. To entitle Vessels classed A "For Channel purposes" to the Figure 1, the equipment of Anchors and Chain Cables, &c., should be as required by Table 22, with the exception that not more than two bower anchors need be supplied, the first bower being of the greatest weight given in the table, and the second bower 15 per cent. lighter, the stream anchor only, being required.

10. In vessels, however, engaged for more extended voyages, such as the Queenboro' and Flushing service, or the Channel Islands or Irish Sea, the equipment must be in accordance with the requirements of Table 22.

11. To entitle IRON VESSELS to retain the Characters assigned to them in the Register Book, they are required to be subjected to the following Special Surveys, designated No. 1, No. 2, and No. 3, respectively.

12. The periods at which these surveys are intended to be held, in the case of vessels classed from 100A to 90A inclusive, are when a vessel is 4 years, 8 years and 12 years old respectively, and at like periods from the date when the No. 3 Survey was held.*

13. In every case the date of build of a vessel is to be reckoned from the last date of the survey for first entry of classification, when such survey is completed within six months of the date of launching: but when the first entry survey is not completed within that period then the date of build will be reckoned from six months after the date of launching. The date when the special periodical surveys respectively become due is to be calculated from the date of build, as above described, or the last date of the No. 3 survey.

14. Similarly, vessels classed 85A and under must be subjected to a special survey every *three* years, as per No. 1, 2, and 3, and afterwards as per No. 1, 2, and 3, consecutively.

15. In any case in which it may suit the convenience of the Owners, the special surveys Nos. 1 and 2 may be held at any time within twelve months previous to the expiration of the period when they severally become due, and the special survey No. 3 may be held at any time before the date when it becomes due.

16. To facilitate the arrangements of owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due.

17. When a special survey is only partially held, the Surveyors must give the Owners or their Agents written notice of the parts not surveyed, and also report the facts to the Committee.

18. If a vessel is at a port in the United Kingdom after the expiration of the prescribed period for survey, and is not subjected to the special survey then due before leaving the United Kingdom, the word "*Expired*" will be inserted against her character in the Register Book; and in no case will a vessel be allowed to retain her class if she has not been subjected to the whole of the requirements of the requisite special survey within twelve months from the date when the survey became due.

19. Vessels which have undergone either of the foregoing examinations will be noted in the Register Book, thus:—*s.s.No.* 1,-91, *s.s.No.*2,-91, *s.s.No.*3-9,91, indicating the special survey and date thereof.

20. At each of these Special Surveys of Steam Vessels, the machinery and boilers—unless they have been specially surveyed within a period of twelve months—are to be examined, as to their safety and efficiency, by the Engineer-Surveyors, and reported upon to the Committee. *See* also pages 12, 68 & 69.

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the subsequent Special Surveys may be Nos. 1, 2, and 3, consecutively, dating from the completion of such No. 3 Survey.

21. Whenever the engines or boilers are taken out, the bearers, with the floor-plates, keelsons, rivets, &c., under them are to be surveyed; and whenever the bottom plating is to be cemented a survey is to be held prior to the cement being laid.

N.B.—In order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage or from other causes, rests with the Owners, Masters, or Agents.*

*Survey No. 1.

1. The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway, proper stages to be made and the holds and peaks to be cleared; the limber boards and ceiling equal to not less than one strake fore and aft on each side removed,† and both surfaces of outside plating exposed,‡ and cleaned and coated where necessary.

2. The coal bunkers to be cleared for examination, and ceiling removed as in the holds.

3. In all vessels the masts, spars, and general equipment must be in good and efficient condition.

4. If the vessel has a double bottom, the ceiling must be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

5. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

6. Note.—*At the Special Survey No.* 1 *succeeding No.* 3, *the chain cables are to be ranged for inspection.* When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch according to their size, they are to be renewed.

7. In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors.

8. The Steam steering engine and its connections to be examined.

9. For periodical Surveys of Engines and Boilers, *see* page 8 paragraph 20, and pages 68 & 69.

*Survey No. 2.

1. The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway; proper stages to be made and the holds and peaks to be cleared; the limber boards and ceiling not less than *three* strakes fore and aft on each side removed, one of which is to be taken from the bilges. Where the ceiling in the flat of bottom is fitted in hatches the whole of the hatches and one strake of ceiling of the bilges are to be removed,† and both surfaces of outside plating exposed,‡ and cleaned and coated where necessary.

2. The coal bunkers to be cleared for examination, and ceiling removed as in the holds.

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

‡ In cases where the inner surface of the bottom plating is coated with cement, or asphalt, if the coating be carefully inspected and tested, by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

3. The windlass at this and all subsequent alternate special surveys to be unhung, where necessary, and its wood linings sufficiently stripped for examination. The chain cables are also to be ranged for inspection at this and all subsequent special surveys. When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch according to their size, they are to be renewed.

4. In all vessels the masts, spars, and general equipment must be in good and efficient condition.

5. If the vessel has a double bottom, the ceiling must be removed therefrom, and the efficiency of the tanks be tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

6. After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No 2, when that survey becomes due, ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the vessel.

7. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

8. The steam steering engine and its connections to be examined.

9. In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* page 8, paragraph 20, and pages 68 & 69.

*Survey No. 3.

1. To be held by two Surveyors, one to be an officer of the Society.—The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway ; proper stages to be made and the holds and peaks to be cleared; all the close ceiling to be removed, so that the rivets, plates of keel, and flat of bottom may be thoroughly examined; coal bunkers of steam vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets and inner surface of the plating to be exposed, and where side lights are fitted, the condition of the plating in way of the same to be ascertained. All oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; the plank sheers and waterways, if of wood to be scraped bright. When the vessel is thus prepared, the Surveyors are to ascertain the thickness of the plating by having holes drilled in such parts as may be deemed necessary,† and to furnish a detailed statement of the thicknesses in their report.

2. Such parts as may be found defective, or materially less than the required substance by Rule are to be removed and replaced with proper materials, equal in substance and quality to the original construction.‡ The plank sheers, waterways, flat of decks and their fastenings, are also to be examined and made good where necessary.

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In cases where the inner surface of the bottom plating is coated with cement, or asphalt, if the coating be carefully inspected and tested, by beating or chipping, and found sound, and adhering satisfactorily to the iron, its removal may be dispensed with.

‡ Where the deterioration in thickness is widespread, and it is not deemed advisable by the owner to renew the material, on a detailed report being made by the resident Surveyor, the class of the vessel will be reconsidered.

3. In all vessels the masts, spars, and general equipment must be in good and efficient condition. All mast and bowsprit wedging at this and subsequent Special Surveys to be removed, unless the plating of iron or steel masts and bowsprits is doubled in way of the same, when it will only be necessary to remove the wedging at the Special Surveys, No. 3. Iron or steel masts, bowsprits, and yards to be carefully tested by hammering, and, if the plates are considered by the Surveyors to be materially wasted at any part, the thickness is to be ascertained by drilling.

NOTE.—*The masts and spars are to be subject to examination by the Surveyors when deemed necessary by them, on other occasions besides Special Surveys.*

4. If the vessel has a double bottom, the ceiling must be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

5. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

6. The chain cables are to be ranged for inspection. When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch, according to their size, they are to be renewed.

7. The steam steering engine and its connections to be examined.

8. In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* page 8, paragraph 20, and pages 68 and 69.

SECOND SPECIAL SURVEY No. 3.

1. The vessel must be submitted to the same survey as before described for *Survey No. 3*, with the following additions:—

2. The condition of the scantlings must be ascertained, the shell plating to be drilled at such parts as the Surveyors may consider necessary to satisfy themselves as to its thickness, the number of holes on each side in no case being less than the number of strakes of plating not covered with cement in the vessel.

3. Care should be taken especially to ascertain the extent of deterioration of steamers in way of the side bunkers and boilers.

4. A sketch showing the thickness at the parts where drilled is to accompany the report on the vessel, for the consideration of the Committee.

5. The plating in way of cement in the bottom need not be drilled provided the cement be found to be adhering satisfactorily to the plating, and the Surveyors consider drilling unnecessary.

SURVEYS WHILE BUILDING.

1. The Surveyors are to examine during the progress of a vessel, the materials and workmanship, from the laying of the keel to her completion; and to point out as early as possible anything that may be objectionable.

2. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey. *See* Section 48, page 57.

ORDINARY SURVEY.

1st. On the several parts of the frame, when in place complete, and before any plating is wrought.

2nd. On the plating, during the progress of riveting.

3rd. When the beams are in and fastened, before the decks are laid.

4th. When the vessel is complete, but before the plating is finally coated or cemented.

5th and last. After the vessel is launched and equipped.

SURVEY OF MACHINERY.

1. In steam vessels the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam. Machinery certificates will be granted, and notifications thereof made in the Register Book, thus: "L.MC. 9,88" *in red* (*i.e.* LLOYD'S MACHINERY CERTIFICATE, September, 1888).

2. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠L.MC.," or "✠N.E.&B.," or "✠N.B."

3. For requirements relating to the survey and construction of engines and boilers, *see* Sec. 48, pages 57 to 69.

RULES FOR THE BUILDING OF IRON VESSELS.

Section 1. 1. In all cases where it is proposed to build ships of iron for classification in the Register Book, a sketch of midship section with longitudinal, deck, and other plans showing the details of the scantlings and arrangements, must in the first place be submitted for the approval of the Surveyors, and in all cases where deviations from the rules are proposed they must be submitted for the approval of the Committee, and the vessel must be built to the plans approved and otherwise in accordance with the following Rules, subject to such modifications as may be deemed necessary by the Committee.

2. The scantlings given in Tables G 1, G 2, and G 3, are intended for vessels the length of which does not exceed *eleven times* their depth from the top of keel. Where this proportion is exceeded *see* Sec. 46 and Table G 6.

3. For proportions of breadth to length *see* Table G 5.

4. The measurements for regulating the scantling numbers and proportions are to be taken as follows:—

LENGTH.

5. The length to be measured from the after part of the stem to the fore part of the sternpost, on the range of the upper deck beams in one, two, and three-decked and spar-decked vessels, but on the range of main deck beams in awning-decked vessels.

6. In vessels where the stem forms a cutwater, the length is to be measured from the place where the upper deck beam line would intersect the after edge of stem if it were produced in the same direction as the part below the cutwater.

BREADTH.

7. The breadth is in all cases to be the greatest moulded breadth of the vessel.

DEPTH.

8. The depth in one and two-decked vessels is to be taken from the upper part of the keel to the top of the upper deck beam at the middle of the length, assuming a normal round up of beam of one quarter of an inch to a foot of breadth In Spar-decked vessels and Awning-decked vessels the depth is to be

taken from the upper part of the keel to the top of the main deck beam at the middle of the length, with the above normal round up of beam. For "Three-deck" steam vessels *see* Section 41.

SCANTLINGS.

Section 2. 1. The scantlings and spacing of the frames, reversed frames, and floor-plates, the thickness of bulkheads and the diameter of pillars in Table G 1 are regulated by numbers, which are produced as follows:—

2. For one and two-decked vessels.—The number is the sum of the measurements in feet arising from the addition of the half-moulded breadth of the vessel at the middle of the length, the depth from the upper part of the keel to the top of the upper deck beams, with the normal round-up, and the girth of the half midship frame section of the vessel, measured from the centre line at top of the keel to the upper deck stringer plate.

3. For "Three-deck" steam vessels.—The number is produced by the deduction of 7 feet from the sum of the measurements taken to the top of the upper deck beams. (*See* Section 41.)

4. For Spar-decked vessels and Awning-decked steam vessels.—The number is the sum of the measurements in feet taken to the top of the main deck beams, as described for vessels having one or two decks.

5. The scantlings of the keel, stem, stern frame, keelson and stringer plates, the thickness of the outside plating and deck; also the scantlings of the angle bars on beam stringer plates, and keelson and stringer angles in hold, as in Tables G 2, G 3, and G 5, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

6. In vessels of exceptional fineness of form, intended for passenger traffic, or to carry a limited amount of cargo with a fixed freeboard, a modification in the scantlings will be admitted, subject to all particulars being submitted by the Builders, and the deviations from the scantlings required by the rules being sanctioned by the owner.

QUALITY OF IRON.

Section 3. 1. The whole of the iron to be of a good malleable quality, capable of withstanding a tensile strain of 20 tons per square inch with, and 18 tons across, the grain, and to be subjected to tests at the discretion of the Surveyors. Brittle or inferior material to be rejected.

2. All plate, beam, and angle iron to be legibly stamped in two places with the manufacturer's name or trade mark, and the place where made, which is also to be stated in the report of survey.

WORKMANSHIP.

Section 4. 1. The workmanship to be well executed, and submitted to the closest inspection, and amended where necessary before coating or painting: it is not, however, intended to prevent the coating of the plates inside in the way of the frames.

KEEL, STEM, STERN, AND PROPELLER POSTS, AND TRANSOMS.

Section 5. 1. The keel, stem, stern, and propeller posts are to be either scarphed or welded together, and to be in size according to Table G 2; if scarphed, the length of scarphs to be nine times the thickness given in the table; and the rivet holes required in the *thin* ends of them are to be drilled after the scarphs are fitted.

2. Where the garboard strakes are thicker than required by the Rules, the thickness of the keel may be proportionately reduced.

3. Where the keel and keelsons are made of several thicknesses of plates, their combined thickness to be the same as is required for a solid keel, as per Table G 2; and the butts of the several plates of which the keel is formed to be carefully shifted from each other.

4. When **Hollow or Flat Plate Keels** are adopted, their breadth and thickness are to be as given in Table G 2; and the strake of plating on each side adjoining the flat plate keel to be of the thickness required for the garboard strakes in the Table.

5. Where flat plate keels are used, intercostal keelson plates, or vertical centre-plates, must be fitted close down on the keel, and connected to it by double angles of the dimensions given for keelson angles in Table G 3, riveted all fore and aft to the keel and keelson. (*See* also Section 9, paragraph 6.)

6. The butt-straps of flat plate keels are to be $\frac{1}{16}$ of an inch thicker than the plates they connect, and treble riveted.

7. The stem at its lower part is to be the same moulding as the keel, and attached to it by a scarph of the same length as the keel scarph; it may be gradually reduced from the height of the load-line to its head, when it may be three-fourths of the sectional area given in Table G 2.

8. The stern and propeller posts, and after end of keel, for single screw propelled vessels, to be of the size given in Table G 2, for stern frames, or of equal sectional area; the portion adjoining the keel to be tapered fair into it. In a sailing vessel, or paddle steamer, the sternpost may be reduced from the lower part of the rudder trunk to its head, where it may be three-fourths of the sectional area given in the Table; and, in a steam vessel having a propeller frame, it may be reduced at the head to the size given for stems in Table G 2.

9. The portion of the forging of the stern frame forming part of the keel, is to extend sufficiently forward for the after end of its scarph in sailing vessels and paddle steamers to be at least once and a half the frame space before the sternpost, and in screw-propelled vessels at least twice and a half the frame space before the propeller post.

10. The sternpost is to be extended sufficiently above the counter to be connected by two vertical angles of the frame size, to the whole depth of the transom-plate, which is to be fitted close against the sternpost. The transom-plate is to be not less than one and a half times the depth of, and the same thickness as, the midship floor-plates. In screw steamers whose plating number is 20,000 and above, the foremost or propeller post should extend sufficiently above the arch of the propeller frame to be efficiently connected to plating on the beams, and to a deep transom-plate. (*See* Section 7, paragraph 7.)

11. The rudder braces are to be forged on the sternpost, and spaced from 4 ft. to 5 ft. 6 in.

12. When cast steel stern-frames, rudders, steering quadrants, and tillers are fitted, they must be subjected to percussive, hammering, and mechanical tests, in the presence of one of the Society's Surveyors, so as to insure the material being of ductile quality. Sketches of the proposed castings are to be submitted for the approval of the Committee. Where stern-frames are in more than one piece, the length of the scarphs should not be less than three times the width of the stern-posts, and the breadth one and a half times the width of the stern-posts, secured by not less than four rows of rivets.

13. The tests to be as follow:—A tensile test is to be made on a piece taken from each casting, and the extension on a length of 8 inches is not to be less than 8 per cent., and the tensile strength not less than 28 tons, nor more than about 35 tons per square inch. A cold bending test also to be made corresponding to each tensile test, and the sample to bend cold before fracture through an angle of at least 90°.

Large stern frames cast in one piece to be let fall on a hard flat ground (excavations being made to take the boss part and other projections), after being raised through an angle of 45°. Stern frames cast in more than one piece and rudders to be dropped from a height of from 7 to 10 feet, according to the design, shape, and the weight of casting. The casting in each case to be subsequently slung up and well hammered with a sledge hammer, not less in weight than 7 lbs., to satisfy the Surveyors that the castings are sound and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

FRAMES.

Section 6. 1. The frames to be of the dimensions set forth in Table G 1, and to extend from the keel to the gunwale. They are to fit closely to the upper edge of the keel; and the after frames should be sufficiently apart transversely to admit of sound riveting and workmanship. At the extreme ends of the vessel the lower parts of the frames opposite to each other are to be lapped and riveted together. Where either raised quarter-decks, bridge-houses, poops, or forecastles, are constructed, the frames are to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale; they may then terminate at the lower part of the curve.

2. When the frames are butted on the keel they are to have not less than 3 feet lengths of corresponding angle bars, fitted back to back, to cover and support the butts and receive the plating for at least three-fourths the vessel's length amidships. Similar pieces of angle bar are to be fitted if the frames are butted elsewhere.

3. The rivet holes to be punched through from the faying surfaces of the frames, and they are not to be punched at the turn of the bilge until the frames are bent to the required shape; the holes in the way of the lands of the plating are to be drilled after the plating is wrought.

4. The spacing of the frames from centre to centre to range from 20 to 26 inches, according to the size of the vessel, which spacing should not be exceeded around the stern of the vessel at the knuckle. (*See* Table G 1.)

FLOOR-PLATES.

Section 7. 1. The floor-plates to be in size at the middle line according to Table G 1, excepting in the engine and boiler space in steam vessels, where they must be $\frac{1}{16}$ of an inch thicker, where the thickness prescribed in Table G 1, is $\frac{9}{16}$ of an inch or under. Where floor-plates are $\frac{9}{16}$ of an inch in thickness and above they may be reduced $\frac{1}{16}$ of an inch for one-tenth the vessel's length before and abaft the three-fifths length amidships, and the remaining floors may be $\frac{2}{16}$ of an inch less in thickness than the midship floors. They are to be moulded not less than one-half their midship depth* at a distance of three-quarters the half-breadth of the vessel set out from the middle line on the run of the frame, and not less at their extreme ends than the moulding of the frames; and they are to extend in a fair curve well up the bilges, in no case terminating lower at the outside of the frame than a perpendicular height of twice the midship depth of the floor above the top of keel. The ends of the floors to maintain the height prescribed for one quarter of the vessel's length amidships, they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level (this place to be determined by the form of the vessel), from which to the ends they are to be gradually increased in depth, so as to efficiently connect the sides; and in the after peak of steam vessels they are to extend above the stern tube. The upper

* In vessels of unusually fine or full form, the moulding should be modified to the approval of the Committee.

parts of the floors forward and aft are to be high enough to give ample room between the reversed frames on each side of the vessel for fitting the keelson angle bars. (*See* also Section 26, paragraph 2.)

2. A floor-plate to be fitted and riveted to every frame, and to be extended across the middle line, except where a vertical centre-plate is adopted, in which case the floor-plates are to be efficiently connected to it on each side by double vertical angles of not less size than the reversed frames.

3. When floors are made in two lengths, the butts are to be well fitted, and to have double butt-straps treble riveted ; or, the floor-plates may be lapped and treble riveted.

4. Floor-plates to which the bulkheads are attached must be deeper than the adjacent floor-plates, to admit of the bulkheads being riveted to them above the reversed angle bars.

5. *In the cases of vessels intended to load or discharge on the ground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which under the circumstances they will be subjected.*

6. **Watercourses** are to be formed above the frames through all the floor-plates on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre-plate, and intercostal keelsons, when such keelsons are adopted, so as to allow water to reach the pumps freely.

7. **Transom-plates** are to be fitted and connected to the frames, and to the stern-post, so as to efficiently support the counter. (*See* Section 5, paragraph 10.)

REVERSED ANGLE IRONS ON FRAMES.

Section 8. 1. Reversed angles on frames to be in size as per Table G 1.

2. Vessels where the number for regulating the size of the frame is below 45, to have reversed angles riveted to every frame and floor-plate, extending across the middle line to the upper part of the bilges.

3. Vessels where the number as per Rule is 45 and below 57, to have reversed angles riveted to every frame and floor-plate, extending across the middle line to the upper part of the double angle stringer above bilges, and to the gunwale alternately; or, if the vessel is of a depth to require hold beams, the reversed angles are to extend to the upper part of the hold beam stringer angle and gunwale alternately.

4. All vessels, except those having an awning-deck, where the number as per Rule is 57 and upwards, to have reversed angle iron, on every frame, extending alternately to the upper deck stringer plate, and top of angle bar on stringer plate next below it. In awning-decked vessels they are all to extend to the upper part of the main deck stringer angle iron. (*See* also Section 26, paragraph 4, and Section 45, paragraph 2.)

5. In sailing vessels where the number as per Rule is 75 and upwards, the reversed frames are to extend to the gunwale on every frame.

6. Double reversed angles to be fitted on every floor, extending from bilge to bilge in the engine and boiler space of steam vessels; and, where the vessel is of 17 feet depth or above from the hold beams, or where the number for plating is 15,000 or above they are to extend sufficiently high to admit of the stringer at upper part of bilge being connected to them. Short double reversed angles are also to be fitted on all frames in way of the keelsons and stringers in hold, connected by not less than three rivets to the frame.

7. The butts of reversed angles, excepting those at middle line, to be secured with butt straps, having two rivets on each side of the butt.

8. The rivets for securing the reversed angles to the frames and floor-plates to be in diameter in proportion to the greatest thickness of angle, or plate, through which they pass, as specified in Table G 1, and to be spaced eight times their diameter, from centre to centre.

9. In vessels where the plating number is 20,000 and above, reversed angles should be fitted to every frame to the height of the upper, spar, or awning deck abaft the after peak bulkhead; and in addition where such vessels have broad flat counters, a double angle stringer should be fitted midway between the middle, and upper, spar, or awning deck beams for a reasonable length, connected by plate knees to the transom plate; or other additional strengthening applied, as the Surveyors may deem necessary.

10. In top-gallant forecastles of vessels whose plating number is 18,000 and above, the alternate reversed frames are to extend to the forecastle deck, or a double angle stringer of the size required for reversed frames is to be fitted inside the frames midway between the upper and forcastle decks, connected at the fore end by an efficient breasthook; or other equally efficient means of strengthening the forecastle may be adopted, if approved by the Committee.

MIDDLE LINE KEELSONS.

MIDDLE LINE SINGLE PLATE KEELSON.

Section 9. 1. The middle line keelson, if of single plate and standing above the floor-plates, to be of the size prescribed in Table G 3, and to have angles of the dimensions given in the same Table fitted and riveted on its upper and lower edges. In addition there is to be a rider plate on the top of the keelson plate, extending over *three-fourths* of the length of the vessel amidships, riveted to the angle irons, the breadth of which is to be equal to the sum of the two broad flanges of the keelson angle irons together with the thickness of the centre plate it covers; the thickness of the rider plate not to be less than prescribed in Table G 3. The butts of the plates and angle irons forming this keelson to be properly shifted, and to be efficiently butt-strapped.

2. The butts of the vertical plate to be secured with double butt-straps, each not less than $\frac{2}{3}$ of the thickness of the plates they connect, and to be treble riveted, or the plates may be lapped and treble riveted; the butt-straps of the rider plate to be fitted on the upper side, and to be treble riveted; the butt-straps of the angle bars to be of sufficient length to have not less than three rivets in each flange properly arranged on each side of the butt.

3. Vessels in which the number for plating is 33,000 and above are to have a foundation plate not less than 18 inches broad and $\frac{10}{16}$ of an inch thick fitted on the top of the floors, under the middle line plate keelson.

MIDDLE LINE INTERCOSTAL KEELSON.

4. If a middle line intercostal keelson be adopted, the plates are to be of the thickness prescribed in Table G 3, and riveted to vertical angles of not less size than the reversed frames, to be fitted and attached to all floor-plates; the intercostal plates to extend from the keel to the top of the floors, and to be fitted close to them. A bulb plate, at least two inches deeper than required for the main deck beams, is to be let down below the top of the floors, between the reversed angles, sufficiently for the intercostal plates to be riveted thereto, and the bulb to be fitted between, and riveted to, two longitudinal angle

bars on the floors, extending all fore and aft, of the size given for keelson angles in Table G 3; or the letting down of the bulb plate may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angles.

5. When intercostal keelsons are adopted with hanging keels, in vessels where the number for plating is 13,000, and under 18,000, instead of a bulb plate there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, having double continuous angles at top and bottom, and a rider plate on its upper edge, of the sizes given in Table G 3; the vertical plate and the rider plate are to be of the thickness required for stringer plates in upper line of Table G 5, and the depth above the floors to be sufficient to admit of the angles being properly fitted. When the number is 18,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table G 3 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table.

6. Where **Flat plate keels** are adopted, intercostal keelson plates attached to the floor plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angles of the dimensions given for keelson angles in Table G 3, riveted all four and aft to the keel and keelson, the spacing of the rivets not to exceed 5 diameters apart. In vessels where the number for plating is 13,000 and under 15,000, or where the length exceeds ten times the depth, instead of a bulb plate, there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, or connected to the centre through-plate, having double continuous angles at top and bottom, and a rider plate on its upper edge; the vertical plate and the rider plate are to be not less in thickness than that given in the upper line of Table G 5 for stringer plates, and the depth above the floors to be sufficient to admit of the angle irons being properly fitted. Where the number is 15,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table G 3 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table. Where the number is 26,000 and above, the flat-plate keel to be doubled for one-half the vessel's length amidships.

CENTRE THROUGH-PLATE KEEL AND KEELSON.

7. If the middle line keelson be formed of a centre through-plate, extending from the lower edge of the keel to the top of the floors, it must be $\frac{2}{16}$ of an inch thicker than that required in Table G 3 for intercostal keelsons. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to the double vertical angles riveted to their ends and to the centre plate keelson, there is to be a flat keelson plate, of the same thickness as, and not less than three-fourths the breadth of, the garboard strakes in Table G 2, riveted to double reversed angles on the upper edge of floors, and to two fore and aft angle bars on the upper edge of the centre through-plate keelson; and where the number for plating is 15,000 and under 18,000, there is to be a bulb plate of the size of the main deck beams, fitted between, and riveted to, two longitudinal angle bars of the size for keelson angles in Table G 3, connected to flat plate keelsons and double reverse bars on top of floors. But should the centre through-plate keelson be extended above the upper edge of the floors, then it is to be connected by two fore and aft angles of the size given in Table G 3, to two flat plates, one on each side of the middle line, to be $\frac{1}{16}$ of an inch thicker than that given for intercostal plates, and one-third the breadth of the garboard strakes, to be well riveted to the double reversed angles on the upper edge of the floors.

Where the number is 18,000 and above, the centre through-plate keelson is to extend sufficiently high above the floor-plates to take two pairs of double angles of the size given for keelson angles, and there is to be a rider plate fitted on the top of the thickness of the keelson plate

8. In all cases the middle line keelson is to be extended as far forward and aft as practicable.

BILGE KEELSONS, AND STRINGERS IN HOLD.

Section 10. 1. All vessels to have bilge keelsons, extending all fore and aft, and placed at the lower turn of the bilges, formed of double angles fitted back to back, of the size given in Table G 3.

2. If the vessel has but a single tier of beams and her number in Table G 3 is under 7,200, a side stringer, formed of the same size angles, is to be fitted about midway between the bilges and upper deck, extending all fore and aft.

3. Where the number is 7,200 and above, and the vessel is under $15\frac{1}{2}$ feet depth to top of keel, two double angle stringers are to be fitted on each side between the bilge keelsons and the deck beams, extending all fore and aft, to be riveted back to back and to double reversed angles on the frames ; the size of them not to be less than those used for the middle line keelson.

4. For stringers in hold, *see* also Section 14.

5. *In the cases of vessels intended to load or discharge on the ground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which under the circumstances they will be subjected.*

SIDE KEELSONS.

Section 11. 1. In vessels where the number in Table G 3 is 13,000, and under 15,000, a double angle keelson is to be fitted on each side, as far forward and aft as practicable, and to be placed about midway between the middle line and bilge keelsons.

2. Where the number is 15,000 and upwards, intercostal plates are to be fitted on each side, as far forward and aft between the floors as practicable, and to be placed about midway between the middle line and bilge keelsons ; these plates are to be fitted close to the floors, and to be attached to the outside plating with an angle of not less size than $3 \times 3 \times \frac{7}{16}$ if the plating number is 21,700 and above, these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$; the intercostal plates are to extend to the top of the floors, and longitudinal plates, in long lengths of the same thickness as the intercostal plates, are to be let down and riveted to them. These plates are to be fitted between, and riveted to, two longitudinal angles of the size given for keelson angles ; or the longitudinal plates may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angle and riveted to them.

3. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms ; but where partial double bottoms are fitted, these keelsons are to extend into, or scarph the double bottom not less than three spaces of frames, and to be connected to the longitudinal girders where practicable.

4. Vessels not being of a size to require side intercostal keelson plates are to have washplates of the thickness given for bulkheads in Table G 1, fitted between the middle line and bilge keelsons for not less than half the vessel's length amidships.

DETAILS RELATING TO KEELSONS AND STRINGERS.

Section 12. 1. Where bulb plate is used for keelsons or stringers, the joints are to be overlapped

and riveted, or otherwise efficiently connected ; if overlapped, the length of lap must not be less than twice the depth of the bulb plate ; iron of other form than bulb may be used for them if of equal strength.

2. All angle bars for keelsons and stringers are to be in long lengths, properly shifted ; and, wherever butted, to be connected with angle or plate, not less than two feet long, fitted in the throat of them, properly riveted to each flange. The thickness of the connecting plates not to be less than the thickness of the angle bars they connect.

3. In all cases the middle line, side, and bilge keelsons, and, where practicable, the stringers, are to be carried fore and aft continuously through the bulkheads, the latter being made water-tight around them ; and, where such parts of the ship are necessarily separated, the longitudinal strength is to be efficiently maintained, to the satisfaction of the Surveyors.

4. The spacing of the stringers at the ends of vessels, having either a single or double bottom, should not exceed the spacing amidships.

5. All keelson and stringer angles may be reduced $\frac{1}{16}$ of an inch in thickness, when above $\frac{7}{16}$ of an inch amidships, for one-fifth the vessel's length at each end.

6. Where keelsons or other longitudinal strengthening are required for a certain portion of the length of a vessel care should be taken to lap or properly shift the same, so as to avoid any abrupt termination of strength.

BEAMS.

Section 13. 1. Beams are to be of the form and size given in Table G 4 ; or they may be composed of any other approved form equal in strength.

2. The beams at the ends of spar and upper deck hatchways of from six to ten frame spaces in length must be equal in size to those of the main or middle deck ; and the beams at ends of awning deck and long bridge hatchways of similar length are to be of the size of spar deck beams.

3. Strong beams in the machinery space of steamers must, in all cases, have double angles on their upper and lower edges.

4. In **Sailing Ships** where the length of the midship hold beam exceeds 39 feet, the hold beams for half length amidships to be one inch more in depth than prescribed in Table G 4, unless they be additionally supported by quarter pillars on alternate beams for the same length. But where the length of midship-hold beam is 43 feet and upwards, both the upper and lower deck beams are to be additionally supported by quarter pillars of the diameter given in Table G 1 for hold and deck pillars at alternate beams, for not less than one-half the vessel's length amidships. When the length of the midship upper deck beams in sailing vessels exceeds 36 feet, the bracket knees to each tier of beams are not to be less than three times the depth of the beam, and the depth at the throat to be not less than once and three-quarters the depth of the beam.

5. In steam vessels of 43 feet and under 55 feet in breadth, the beams are to be supported by quarter pillars at alternate beams for half the vessel's length amidships, in addition to the centre line pillars ; and in vessels of 55 feet in breadth and above, the quarter pillars of the diameter given in Table G 1 for hold and deck pillars are to be fitted to every beam. In steamers where the middle deck is fitted exclusively for the accommodation of passengers, quarter pillars need not be fitted if the ship is less than 50 feet in breadth.

6. Beams to be well and efficiently riveted to the frames, with bracket ends or knee-plates; each arm of knee-plates not to be less in length than twice and a half, and the depth at the throat not less than once and a half, the depth of beams, and to be in thickness equal to the beams; and not more than two holes in each beam arm or frame to be punched before the beam is in place.

7. The round-up of the beams of all weather decks should not be less than one quarter of an inch per foot of length of beam. This round-up of beam will be assumed in taking the measurement for regulating the scantlings, and arrangement of beams and stringers in hold; and in all cases where a freeboard is assigned by the Committee, this amount of round-up will be assumed as the standard in determining the minimum freeboard which is required for insertion in the Register Book.

8. The beams of the various decks, or of tiers of beams, are to be placed over each other. For variations and reductions in sizes of beams at the ends of vessels see Table G 4, and footnotes.

9. The knees of beams 6 inches in depth to be secured to the frames by not less than four $\frac{3}{4}$ inch rivets. Beams of 7 inches to $8\frac{1}{2}$ inches in depth to have five $\frac{3}{4}$ inch rivets; beams 9 inches to $9\frac{1}{2}$ inches to have five $\frac{7}{8}$ inch rivets; beams 10 inches to $10\frac{1}{2}$ inches to have six $\frac{7}{8}$ inch rivets; and beams 11 inches to 12 inches to have seven $\frac{7}{8}$ inch rivets in the knees.

10. Where beam knees are required to be three times the depth of the beam an additional rivet is to be fitted.

SPACING OF BEAMS AND STRINGERS IN HOLD.

Section 14. 1. The spacing of beams is to be regulated by the depth amidships, measured from the top of keel to the top of the upper, spar, or awning-deck beams as described in Section 1, paragraph 8, excepting in awning-decked vessels of less than $17\frac{1}{2}$ feet depth to the main deck, in which case the arrangement of stringers in hold, &c., is to be regulated by the depth to the main deck. (*See* also Section 10, paragraphs 2 and 3.)

2. All upper deck beams and the middle deck beams of three-decked ships, and the main deck beams of spar and awning-decked ships, to be fastened to alternate frames, except where iron decks are fitted as provided for in Table G 4.

3. All Vessels under 13 feet in depth are to have a double angle stringer extending all fore and aft about midway between bilge keelson and deck beams, riveted back to back and to double reversed angles on the frames.

4. All Vessels of 13 and under 14 feet in depth to have, in addition to the foregoing, bulb plate of the size required for the deck beams, riveted between the continuous double angle stringer for three-fifths the vessel's length amidships; or the bulb may be dispensed with, provided that, in lieu thereof, intercostal plates in long lengths be fitted between the double angle stringer, and attached by single angle to the outside plating.

5. All Vessels of 14 and under $15\frac{1}{2}$ feet in depth to have, instead of the bulb plate, as described above, a plate not less than 12 inches wide and $\frac{7}{16}$ of an inch thick, connected to the outside plating with double angles fitted on the inner edge of the size of the keelson angles, extending all fore and aft.

6. All Vessels of $15\frac{1}{2}$ feet depth and above to have a double angle stringer of the size given in Table G 3, extending all fore and aft at the upper turn of the bilge on each side.

7. All Vessels of $15\frac{1}{2}$ and under $16\frac{1}{2}$ feet in depth to have hold beams of extra strength, as given in Table G 4, fastened to every tenth frame, with a stringer plate of the size given in Table G 5 for hold

beam stringers, attached to the plating and supported by brackets at every alternate frame between the beams, and secured to the beams by efficient gusset plates.

8. **All** Vessels of $16\frac{1}{2}$ and under $17\frac{1}{2}$ feet in depth to have hold beams of extra strength, as given in Table G 4, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table G 5, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate. On the inner edge of the stringer plate, between the beams, an angle bar is to be fitted, of the size given for keelson angle irons in Table G 3, with its deep flange vertical, and covering the ends of the bracket plates.

9. **All** Vessels of $17\frac{1}{2}$ and under $18\frac{1}{2}$ feet in depth to have hold or lower deck beams fastened to every second and fourth frame alternately; or, they may have hold beams of extra strength, as given in Table G 4, fastened to every tenth frame, with an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case.

10. **All** Vessels of $18\frac{1}{2}$ and under $19\frac{1}{2}$ feet in depth to have hold or lower deck beams fastened to every second and fourth frame alternately; or, they may have hold beams as described in the foregoing paragraph, fastened to every tenth frame, provided double angle bars, $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of the stringer plate with a face plate $\frac{7}{16}$ of an inch in thickness, and gusset plates at the beam ends.

SAILING VESSELS.

11. **Sailing Vessels** of $19\frac{1}{2}$ and under 23 feet in depth to have hold or lower deck beams fitted to every alternate frame.

12. SAILING VESSELS of 23 and under 24 feet in depth from the upper part of the upper deck beams, or of 16 and under 17 feet from the upper part of the hold or lower deck beams to the top of the keel, to have the lower deck beams fitted to every alternate frame, and to have two double angle stringers extending fore and aft, between the bilge keelson and hold or lower deck beams, on each side.

13. SAILING VESSELS of 24 and under 26 feet in depth from the upper part of the upper deck beams, or 17 and under 18 feet from top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have, in addition to the above, bulb plates of the size of the hold beams fitted and riveted between each of the two side stringers in lower hold on both sides, to extend all fore and aft.

14. SAILING VESSELS of 26 and under 27 feet in depth, from the upper part of the upper deck beams, or 18 and under 19 feet in depth, from top of lower deck beams, to have, in addition to the foregoing, intercostal plates of the thickness given in Table G 3, attached to the outside plating, and fitted to the upper stringer, all fore and aft, and to the lower stringer from one quarter of the vessel's length aft, until it is incorporated with the panting stringer.

15. SAILING VESSELS of 27 and under $28\frac{1}{2}$ feet in depth from upper deck, or of 19 and under $20\frac{1}{2}$ feet in depth from top of lower deck beams, are to have the lower deck beams fitted to every alternate frame, and to have orlop stringer plates of the dimensions required for hold beam stringer plates in Table G 5 fitted and attached to the outside plating and reversed frames by angle bars of the size given in Table G 3, These stringers to be supported by bracket-plates riveted to them, and to alternate frames; and upon the inner edge of the stringer-plate an angle bar of the size of keelson angles, as per Table G 3, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or, if preferred, an

additional side stringer to those required in the preceding paragraph may be fitted, formed of double angles, bulb, and intercostal plates attached to the outside plating and fitted all fore and aft.

16. SAILING VESSELS of $28\frac{1}{2}$ and under $29\frac{1}{2}$ feet in depth from the upper deck, or of $20\frac{1}{2}$ and under $21\frac{1}{2}$ feet from the top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have orlop beams, of the size given in Table G 4 for "hold beams of extra strength" fitted to every tenth frame, with an angle bar on the inner edge of the stringer plate, as in the preceding paragraph; or these beams may be twelve frame spaces apart, provided double angles, $4 \times 3\frac{1}{2} \times \frac{7}{16}$ be fitted on the inner edge of the stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness. These beams are to be secured to the stringer plate by efficient gusset plates.

STEAM VESSELS.

17. **Steam Vessels** of $19\frac{1}{2}$ and under 22 feet in depth to have hold beams fastened to every alternate frame; or hold beams of extra strength, as given in Table G 4, may be fitted to every eighth frame provided an angle bar, of the size given for keelson angles in Table G 3, be fitted on the inner edge of the stringer plate, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angle bars $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$, and a face plate, $\frac{8}{16}$ of a inch in thickness, be fitted on the inner edge of the stringer plate, with gusset plates as above.

18. STEAM VESSELS of 22 and under 23 feet in depth to have, in addition to the foregoing, an extra side stringer, formed of double angles of the size of the keelson angles, fitted between the hold beams and bilge stringer, extending as far forward and aft as practicable.

19. STEAM VESSELS of 23 and under 24 feet in depth to have, in addition to the above, a bulb plate of the size required for hold beams, fitted between the double angles of each of the side stringers, all fore and aft.

20. STEAM VESSELS of 24 and under 26 feet in depth from the upper part of the upper deck beams, or of 17 and under 18 feet from the upper part of the lower deck beams to the top of the keel, to have the lower deck beams fitted to every alternate frame, and to have hold beams of extra strength, as given in Table G 4, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table G 5 for hold beam stringer plates; and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; and on the inner edge of the stringer plate, between the beams, an angle bar is to be fitted, of the size given for keelson angles in Table G 3, with its deep flange vertical, and covering the ends of the bracket plates.

21. STEAM VESSELS of 26 and under 27 feet in depth from the upper deck, or 18 and under 19 feet from top of the middle deck beams, to have hold beams fastened to every second and fourth frame alternately. Or they may have hold beams of extra strength, as given in Table G 4, fastened to every eighth frame; and to have an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case; or they may be spaced wider, not exceeding ten frame spaces, provided double angles, $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$ be fitted on the inner edge of the stringer plate, with a face plate on them $\frac{7}{16}$ of an inch in thickness.

22. STEAM VESSELS of 27 and under 28 feet in depth from the upper deck, or 19 and under 20 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every second and

fourth frame alternately. Or they may have hold beams of extra strength as given in Table G 4, fastened to every eighth frame, and to have an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case; or these beams may be ten frame spaces apart, provided double angles, $4 \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness.

23. Steam Vessels of 28 and under 30 feet in depth from the upper deck, or 20 feet and under 22 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame. Or, if hold beams of extra strength, as given in Table G 4, be fitted, they may be fastened to every eighth frame, provided an angle bar, of the size given for keelson angles in Table G 3, be fitted on the inner edge of the stringer plate and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angles, $4 \times 4 \times \frac{8}{16}$ and a face plate $\frac{9}{16}$ of an inch in thickness be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends.

24. Steam Vessels of 30 and under $32\frac{1}{2}$ feet in depth from the upper deck, or 22 and under $24\frac{1}{2}$ feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame. Or, if hold beams of extra strength, as given in Table G 4, be fitted, they may be fastened to every eighth frame, provided an angle bar of the size given for keelson angles in Table G 3, be fitted on the inner edge of the stringer plate, and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angles, $4 \times 4 \times \frac{8}{16}$, and a face plate $\frac{9}{16}$ of an inch in thickness, be fitted on the inner edge of the stringer plate with gusset plates at the beam ends. In either case, in addition, a double angle stringer, of the size given for keelson angles in Table G 3, with bulb plate between, is to be fitted midway between the bilge stringer and the hold beams.

25. Steam Vessels of $32\frac{1}{2}$ and under 36 feet in depth from the top of the upper deck beams to the top of keel, or in which the depth from the top of the lower deck beams is $17\frac{1}{2}$ and under 21 feet, to have the lower deck or hold beams fitted to every alternate frame, and to have below them an orlop stringer plate attached to the outside plating and reverse frames, of the thickness, and three-fourths of the breadth, of the lower deck stringer plates, supported by bracket plates riveted to them and to alternate frames; and upon the inner edge of the stringer plate an angle bar, of the size of keelson angles, as per Table G 3, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or a stringer of other form may be fitted, if approved by the Committee.

26. Steam Vessels of 36 and under 39 feet in depth from the top of the upper deck beams to the top of keel, or in which the depth from the top of the lower deck or hold beams is 21 feet or above, are to have the lower deck beams fitted to every alternate frame, and to have orlop beams, of the size given in Table G 4 for "hold beams of extra strength," fitted to every tenth frame, with stringer plates on them, and gusset plates at their ends. The stringer plates to have angle bars on their inner edge, as in preceding paragraph.

27. Gusset plates to be fitted to hold beam stringer plates at all bulkheads where strong hold beams are fitted.

28. Plans of all vessels above 39 feet in depth must be submitted for the consideration of the Committee, with a view to additional strength being provided; and in all vessels where the height between deck stringers at the sides is 8 feet or above, at any part, additional transverse strength at such part must be submitted for approval.

29. When the beams exceed two spaces of frames apart, a knee or bracket plate is to be riveted to alternate frames and to the stringer plate of the thickness required for the frames amidships.

30. Notwithstanding the foregoing arrangements for the spacing of beams, whenever a deck is laid, the beams are not to be further apart than two frame spaces.

31. Where it is necessary, in consequence of long hatchways, engine-rooms, boiler spaces, &c., to dispense with some of the hold or lower deck beams, compensation must be made by fitting hold beams of extra strength, as given in Table G 4, with gusset plates, and angle bars, &c., on the stringer plates—or extra web frames to the satisfaction of the Committee.

32. If an arrangement differing from the foregoing in the spacing of the hold beams, to suit convenience of stowage, be required, a sketch showing beams and stringers of extra strength, or web frames with all particulars, must be submitted through the resident Surveyors, who are to state their opinion thereon, for the Committee's consideration.

33. In way of raised quarter decks, where the depth from the top of the keel to the top of the raised quarter deck beam is 24 feet, or above, and the lower deck hatchways are not framed, a web frame is to be fitted abreast of the hatchway, extending from the floors to the upper deck. Where web frames are fitted in lieu of strong hold beams and the lower deck hatchways are not framed, the web frames in way of the hatchways are to be spaced as required by Section 14A, and extended to the upper deck.

WEB FRAMES IN LIEU OF HOLD BEAMS. *(See also sketches after page 79.)*

Section 14a. 1. Web frames in conjunction with side stringers in hold will be admitted in lieu of wide spaced hold beams and stringers, if arranged in accordance with the conditions specified below:—

The depth of the vessel for regulating the spacing and depth of web frames, and the number of side stringers required to be fitted, is to be taken from the top of the keel to the top of the first complete tier of beams (other than wide spaced beams), assuming the beams to have the normal round-up of one quarter of an inch to the foot of length of beams.

2. When web frames and side stringers are fitted in lieu of hold beams, the web frames and stringers are to be of the thickness required for the frames.

3. Double angles are to be riveted on the inner edge of the web frames and stringers; these angles and those connecting the stringers to the web frames and outside plating, also the angles connecting the stringers to the reversed frames, between the web frames, are to be of the same size as the reversed frames. Single angles of equivalent strength may be substituted for the double angles described above, provided double angles be fitted in way of the diamond plates described in next paragraph. The web frames to be attached to the margin plate of double bottom by double angles, or to the inner bottom by efficient gusset plates.

4. An efficient diamond plate of the thickness of the web frames is to be fitted at the junction of the web frames and stringers, and to be not less than 24 ins. × 18 ins. for web frames 14 inches deep; 30 ins. × 21 ins. for web frames 15 inches deep; and 30 ins. × 24 ins. when the depth of the web frames exceeds 15 inches.

5. The through beams attached to the head of web frames are to be in all cases of the depth required for "beams of extra strength," excepting where an iron deck is fitted on these beams, in which case they may be of the ordinary rule size of beams to alternate frames, provided the knees be three times the depth

of the beam. Where web frames are extended to the upper or raised quarter deck in vessels of 23 feet depth to the top of keel and above, the length of beam knees to be three times the depth of the beam.

6. When web frames are fitted in way of half beams they are to be connected at the head by large bracket knee plates.

7. The side stringers are to be supported by a bracket knee plate of the thickness required for frames midway between the web frames, when 18 inches in width, except when the web frames are spaced 8 feet apart, when the bracket plates will not be required.

8. On those frames where web frames are not fitted the reversed frames are to extend to the upper deck and the stringer plate next below alternately, except in three-decked and spar-decked vessels, where web frames are fitted below the middle deck, in which case the reversed frames are to extend as specified in Section 41, paragraph 5, and Section 42, paragraph 6 respectively.

9. **Vessels of under 16 feet in depth from top of keel,** requiring hold beams, to have web frames 14 inches in depth, eight frame spaces apart, with one side stringer plate above the bilge stringer, fitted intercostally between the web frames, and connected to them by angles and diamond plates as previously described.

10. **Vessels of 16 feet and under 17 feet in depth,** to have web frames 15 inches deep, not more than eight frame spaces apart, with one side stringer plate above the bilge stringer as described in preceding paragraph.

11. **Vessels of 17 feet and under 18 feet in depth,** to have web frames 15 inches deep, not more than eight frame spaces apart, with two side stringers, in which case the double angle bilge stringer may be omitted (except in vessels requiring three tiers of beams, and under 18 feet to the middle or lower deck, when the web frames should be not more than six frame spaces apart).

12. **Vessels of 18 feet and under 21½ feet in depth,** to have web frames 15 inches deep, not more than six frame spaces apart, with two side stringers. When of this depth to the middle deck, the web frames are to be 18 inches deep.

13. **Vessels of 21½ feet and under 22½ feet in depth,** to have web frames 15 inches deep, not more than six frame spaces apart, with three side stringers, or web frames with two side stringers 18 inches deep may be substituted, in vessels fitted with a double bottom, provided the brackets outside the margin plate be extended up the bilges to a height of three times the depth of the ordinary rule floor at the middle line. When of this depth to the middle deck the web frames to be 18 inches deep, with three side stringers.

14. **Vessels of 22½ feet and under 23½ feet in depth,** to have web frames 16 inches deep, not more than six frame spaces apart, with three side stringers. When of this depth to the middle deck, the web frames to be 18 inches deep.

15. **Vessels of 23½ feet and under 24 feet in depth,** to have web frames 18 inches deep, spaced not more than six frame spaces apart, with three side stringers, as in the preceding paragraph.

Web frames in way of RAISED QUARTER-DECKS, in lieu of lower deck beams and beams of extra strength wide spaced in lower hold.

16. **Vessels of 24 feet and under 25 feet** to the quarter-deck, to have web frames 16 inches deep, five frame spaces apart, with three side stringers; and not less than four beams of extra strength, formed of plate and four angles as prescribed in Table G 4 are to be fitted and efficiently connected to one of the side stringers, and to the web frames by large gusset plates and vertical bracket plates, of the thickness of

the side stringers. In addition, a water-tight tranverse bulkhead to be fitted about midway between the after engine-room bulkhead and the after end of the vessel.

17. **Vessels of 25 feet and under 26 feet,** to have web frames 16 inches deep, from four to five frame spaces apart, with three side stringers, and not less than four beams of extra strength, and an additional water-tight bulkhead as in preceding paragraph.

18. **Vessels of 26 feet and under 27 feet,** to have web frames 18 inches deep, four frame spaces apart, with three side stringers and not less than four strong beams, and an additional bulkhead as above.

19. **Vessels of 27 feet and under 28 feet,** to have web frames 18 inches deep, four frame spaces apart, with four side stringers and not less than four strong beams, and an additional bulkhead as previously described.

20. In all cases where web frames are fitted in lieu of lower deck and hold beams, as set forth in the foregoing paragraphs, the bulkheads are to be additionally stiffened by a centre vertical web and semi-box beam, so as to compensate in an efficient manner for the omission of the support which would be afforded by these decks in case such were fitted.

PILLARS.

Section 15. 1. All beams the length of which exceeds one half that of the midship upper deck beams to be pillared where practicable. Where pillars are required to the upper deck beams the pillaring must be completed down to the keelson. The pillars to the coamings of hatchways should not exceed 4 frame spaces apart on each side, and all hatchways 26 feet in length and above are to be pillared at the corners; in addition, the beams under deck houses, bowsprit, pall bitt, windlass, steam winches, and capstan are to be pillared, and wherever else the Surveyors may deem necessary; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper, spar, or awning deck, and to be of the size given in Table G 1. Where a vessel has three decks or tiers of beams, the size of the pillars to the middle tier is to be a mean between the sizes given in Table G 1.

2. In **Sailing Ships** where the length of the midship hold beam exceeds 39 feet, the hold beams for half length amidships to be one inch more in depth than prescribed in Table G 4, unless they be additionally pillared by quarter pillars on alternate beams for the same length. But where the length of midship hold beam is 43 feet and upwards, both the upper and lower deck beams are to be additionally supported by quarter pillars at alternate beams, of the diameter given in Table G 1 for hold and deck pillars, for not less than one-half the vessel's length amidships.

3. In **Steam Vessels** of 43 feet and under 55 feet in breadth, the beams are to be supported by quarter pillars at alternate beams for three-fourths the vessel's length amidships, in addition to the centre line pillars, and in vessels of 55 feet in breadth and above the quarter pillars of the diameter given in Table G 1 for hold and deck pillars are to be fitted in the 'tween decks to every beam. In steamers where the middle deck is fitted exclusively for the accommodation of passengers, quarter pillars need not be fitted if the ship is less than 50 feet in breadth.

4. Quarter pillars to be of the diameter given in Table G 1 for hold and deck pillars.

5. All pillars to have solid welded heads and heels.

6. Pillars which extend from the keelson to the upper deck beams in vessels with two decks, or tiers of beams, or with one deck and web frames; or to the middle deck beams in vessels with three decks, or tiers of beams, or with two decks and web frames; and the hold pillars in sailing ships of 22 feet depth

of hold and above, are to have their diameter increased by $\frac{3}{8}$ of an inch beyond that given in Table G 1. When pillars extend in one length from the floors to the upper deck in vessels requiring three tiers of beams, their diameter is to be increased $\frac{3}{4}$ of an inch beyond that given in Table G 1 for hold pillars.

7. Where double pillars are fitted for the purpose of securing shifting boards, they are not to be less than three-fourths the diameter for single pillars.

8. Where hollow pillars are to be used, they are to be of malleable steel or iron, of the diameter and thickness given in Table G 1, with solid welded heads and heels.

9. If pillars be fitted on a shaft tunnel, the tunnel should be strengthened in way of them, by doubling plates, angle bars, and a transverse vertical plate, or by other efficient means to the satisfaction of the Surveyors, but it is considered preferable that the pillars be fitted clear of the tunnel.

10. The beams in the engine-room to be pillared wherever practicable.

11. Where a middle line bulkhead is fitted in lieu of pillars, the thickness is not to be less than $\frac{5}{16}$ connected at the bottom and to plating on the beams by double angles not less than $3 \times 3 \times \frac{7}{16}$, and stiffened vertically by double angles or tee bars of equivalent strength to the pillars required by Table G 1, and paragraph 5 of this section, spaced two frame spaces apart; the stiffeners on one side of the bulkhead to be attached to the beams.

STRINGERS ON BEAMS.

Section 16. 1. All vessels to have stringer plates upon ends of each tier of beams. Those upon the ends of the upper deck beams of one and two deck vessels, the upper and middle deck beams of three deck vessels, and upon the main deck beams of spar and awning-decked vessels, to be of the breadth and thickness given for main stringer plates in Table G 5, for half the vessel's length amidships; from thence to the ends of the vessel they may be gradually reduced to the dimensions given for the ends of main stringer plates in Table G 5.

2. The stringer plates on ends of the beams next below the upper deck in two deck vessels, and below the middle deck in three deck vessels, and below the main deck in spar or awning-decked vessels to be of the breadth and thickness given for hold beam and lower deck stringers in Table G 5.

3. The stringer plates on the ends of spar-deck beams are to be the breadth of and may be $\frac{1}{16}$ of an inch less in thickness than the stringer plates given on the upper line of Table G 5 for vessels of the same plating number, and may be reduced at their ends $\frac{1}{16}$ of an inch in thickness, and to the breadth given for the ends of main deck stringer plates in Table G 5.

4. The stringer plates on the ends of awning deck beams to be as per Section 43, par. 9.

5. The stringer plates on all tiers of beams are to be fitted home and riveted to the outside plating, all fore and aft, with angle bars of the dimensions required by Table G 3; the middle, lower, and orlop deck stringer plates to have an additional angle bar of the same dimensions extending all fore and aft, riveted to the reversed frames and to the stringer plates. (For riveting of butts *see* Section 20.)

6. In cases where no deck is laid, and the width of the stringer plate on the ends of the hold beams is objected to, it may be reduced, provided such reduction be fully compensated for and receive the sanction of the Committee.

7. When the frames are extended through the upper deck stringer plate to form frames for bridge-houses, or poops and forecastles, there must be a continuous angle bar, of the size given for lower deck stringer angles, wrought on the upper deck stringer plate inside the frames.

8. The main and hold beam stringer plates may be reduced at the ends of the vessel to the sizes given for the same in Table G 5.

9. The upper deck stringer angle bar is in all cases to be fitted on the upper side of the stringer plate.

10. When gutter waterways are fitted to upper decks in vessels having poops or forecastles, the angle bars forming the ends of the gutters are to be welded, and the gutters to be carefully caulked.

TIE-PLATES ON BEAMS.

Section 17. 1. All vessels to have tie-plates ranging all fore and aft upon each side of the hatchways on each tier of beams, these plates to be lapped or butted, and at least double riveted. Upon hold beams or lower deck beams spaced two to four frame spaces apart on which no deck is to be laid, or where tie plates would interfere with stowage of cargo, double angle bars of the dimensions given in Table G 3 for angle bars on lower deck beam stringer plates, placed at middle line or at each side of the hatchways, extending fore and aft wherever practicable, and well riveted to all beams and stringers, will be admitted in lieu thereof.

2. Diagonal tie-plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged; and in addition, where the plating number is 15,000 and above, diagonal tie-plates are to be fitted all fore and aft on the upper deck.

3. Where diagonal tie-plates cross each other, or the fore and aft tie-plates, between the beams, and a deck is to be laid thereon, one set of tie-plates must be set down in way of the crossing, so as to leave one thickness only projecting above the beams.

4. The tie-plates to be of the width and thickness given in Table G 5, for half the vessel's length amidships, tapered at the ends to the same thickness as the ends of the stringer plates. They are to be well riveted to each other and to the beams and stringers; and all butts to be properly shifted.

HOOKS AND CRUTCHES, AND PANTING ARRANGEMENTS.

Section 18. 1. All stringers, where practicable, to extend fore and aft, and to be efficiently connected at their ends with plates forming hooks and crutches of the same thickness as the floor plates amidships, and those below the hold beams should be spaced about 4 feet apart. In vessels whose plating number is 24,000, or above, an additional hook or crutch should be fitted at the ends of the vessel, between each tier of beams, to the satisfaction of the Surveyors.

2. The depth for regulating the number of tiers of beams to alternate frames in the fore peak to be taken at the collision bulkhead, and the beams fitted in accordance with Section 14 for this depth. All vessels to have, in addition, provision made to prevent panting by extra beams, bracket knees and stringer plates being fitted before and abaft the collision bulkhead. Panting beams and stringers to be fitted at the after end where considered necessary by the Surveyors.

3. Sailing vessels under 20 feet in depth at the collision bulkhead, to have lower deck or panting beams fitted to alternate frames in the peak, with a stringer plate two-thirds the breadth of the lower deck stringer plate amidships. Vessels 20 feet and under 30½ feet in depth to have in addition to the lower deck beams, a tier of panting beams with a stringer plate two-thirds the breadth of the lower deck stringer

plate amidships. Vessels 30½ and under 33 feet in depth to have two tiers of panting beams below the lower deck with stringer plates on their ends.

4. The stringer plates on the panting beams to be attached to the outside plating when fitted in continuation of intercostal stringers. These plates are to extend abaft the collision bulkhead for a length of not less than one-fourth the midship breadth of the vessel, and be efficiently supported by brackets at alternate frames. Panting beams and stringers to be fitted at the after end where considered necessary by the Surveyors.

5. Plans of proposed panting arrangements in vessels of 33 feet in depth and above to be submitted for the consideration of the Committee.

PLATING.*

Section 19. 1. The thickness of the outside plating as given in Table G 2, for half the vessel's length amidships, is to be maintained for that length, but it may thence be gradually reduced to the thickness given for extreme ends by gradations of $\frac{1}{16}$ of an inch over equal parts before and abaft the half length amidships. In all screw steamers the garboard plates connected to the stern frame, and where the plating number is 16,600 or above, also the after lengths of plating so connected, must be of the thickness required for the same strake amidships. In sailing vessels the outside or overlapping strakes of plating for one quarter of the vessel's length at her fore end should only be reduced $\frac{1}{16}$ of an inch from the midship thickness; and where the plating number is 16,000 or above, three strakes of plating at the bilges are to be increased $\frac{1}{16}$ of an inch in thickness throughout, and when the plating number is 22,000 and above, the strake of plating in way of the hold beams is to be increased $\frac{1}{16}$ of an inch in thickness for one-half the vessel's length amidships.

2. In the columns for plating in Table G 2, where two thicknesses are given they are to be worked in alternate strakes, and the greater thickness is to apply to the outer strakes, and the lesser thickness to the inner strakes; and the size of the rivets and double riveting are to be regulated by the thickness of the thicker plating.

3. No plates to be less in length than six spaces of frames, except the fore and after lengths.

4. No butts of outside plating in adjoining strakes to be nearer each other than two spaces of frames and the butts of the alternate strakes not to be under each other, but shifted not less than one frame space.

5. The butts of the upper or main deck, and of spar-deck stringer plates, in all cases, to be shifted not less than two spaces of frames clear of the butts of the sheerstrakes.

6. The butts of the garboard strakes to be shifted clear of the keel scarphs, and not to be nearer each other on opposite sides of the vessel than two spaces of frames.

7. All butts of plating, where practicable, to be planed and fitted close; the edges of the plating to be sheared from their faying surfaces, or the burr caused by shearing to be carefully chipped off, and all outside edges of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

8. The breadth and thickness of the sheerstrakes and garboard strakes to be as given in Table G 2.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have the butt-straps double or treble riveted, as may be required by Section 20, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges.

9. The sheerstrakes in one, two, and three-decked, and spar-decked vessels to be fitted sufficiently high above the upper deck beam ends, so as to take at least two rows of rivets vertically in the butts above the upper flange of the gunwale angle bar.

10. The boss-plates covering the screw shaft are to be the same thickness as the strakes amidships of which they form part where the number for plating is under 14,300; if that number and under 18,700, the plates are to be $\frac{1}{16}$ of an inch thicker; and if the number is 18,700 and under 26,400 the plates are to be $\frac{1}{16}$ of an inch thicker than the midship plating, and the butts treble riveted; and, where the number is 26,400 and above, the boss-plates and the plates above and below the same to be $\frac{2}{16}$ of an inch thicker than the midship plating, and their butts double-strapped, or lapped and treble riveted; or the boss-plates are to be doubled.

11. When plates forming the outside strakes of plating are above 40 inches but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{16}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by Section 20 to be treble riveted, the straps required by that section should be of this increased thickness.

12. Where gutter waterways are adopted at the upper deck, the butt-straps of the bulwark plating are to be sufficiently broad to receive the spur in the middle of the bulwark stay; and when the plates do not exceed 12 feet in length they are to have stays fitted against the butt-straps, and an intermediate stay is to be fitted between the butts on straps or doubling plates. In no case are the stays which support the bulwarks to be more than 6 feet apart. Their size may be from $1\frac{3}{8}$ in. to 2 in. in diameter, regulated by the length of the stay and the size of the vessel. These arrangements may be modified according to circumstances, if to the satisfaction of the Surveyors.

BUTT-STRAPS AND LINING PIECES.

Section 20. 1. In vessels whose plating number does not exceed 8,000, the butt-straps of the sheerstrake, deck stringer plate, and one strake at the bilges for half the vessel's length amidships, are to be $\frac{1}{16}$ of an inch thicker than the plates they connect, and to be double riveted.

2. When the plating number is above 8,000 and not exceeding 13,000 the butt straps of the sheerstrake, deck stringer plate, and two strakes round the bilges are to be $\frac{1}{16}$ of an inch thicker than the plates they connect, for half the vessel's length amidships, and treble riveted.

3. When the plating number is over 13,000 and not exceeding 17,000, an additional strake of bilge plating is to be treble riveted at the butts for half the length amidships with straps $\frac{1}{16}$ of an inch thicker than the plates they connect.

4. When the plating number is over 17,000 and not exceeding 24,000, the butts of the sheerstrake, deck stringer plate, and four strakes of bilge plating are to be treble riveted with straps $\frac{1}{16}$ of an inch thicker than the plates they connect, for half the vessel's length amidships.

5. When the plating number is above 24,000 and not exceeding 28,000, the butts of the sheerstrake, four strakes of bilge plating, and the remaining outer strakes of plating, and those of the upper and middle deck stringer plates, are to be treble riveted for half the vessel's length amidships with straps $\frac{1}{16}$ of an inch thicker than the plates they connect.

6. When the plating number is above 28,000 and not exceeding 33,000, the whole of the butt-straps for half length amidships, including those of the upper and middle deck stringer plates, are to be treble riveted, and to be $\frac{1}{16}$ of an inch thicker than the plates they connect.

7. Where the plating number is above 33,000 and not exceeding 40,000, the whole of the butt straps of the outside plating, and the upper and middle deck stringer plates, are to be $\frac{2}{16}$ of an inch thicker than the plates they connect, and treble riveted for two-thirds the vessel's length amidships.

8. The butt-straps of flat keel plates are to be treble riveted, and as much thicker than the plates they connect as is required for bilge strakes.

9. The rivets in the butt-straps of outside plating and the upper and middle deck stringer plates to be spaced not more than 4 diameters apart from centre to centre with half the number of rivets in the back row.

10. When plates forming the outside strakes of plating are above 40 inches, but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{16}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by the preceding paragraphs to be treble riveted, they should be of this increased thickness.

11. All butt-straps to be of the breadth given in Table G 8, and in no case where single, to be less in thickness than the plates they connect; the fibre of the iron to be in the direction of the fibre of the plates they connect.

12. Where the butts of plating are overlapped, the width of for one-half of the vessel's length amidships, the laps and the riveting of the same are to be as given in Table G 8. In vessels where the plating number is under 16,000, the lap butts of the outside plating for one-half the vessel's length amidships to be treble riveted, and the remaining butts double riveted, and where the plating number is 16,000 and above, the lap butts are to be treble riveted throughout. The treble riveted butts to have three complete rows of rivets.

13. Where double butt-straps are fitted to stringer plates, sheerstrakes, and outside plating, the thickness of straps, to be as given in the following Table :—

Thickness of Plating.	Strap which is countersunk for Rivets.	Strap on opposite side of Plate.
inches.	inches.	inches.
$\frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
$\frac{10}{16}$	$\frac{8}{16}$	$\frac{6}{16}$
$\frac{11}{16}$	$\frac{8}{16}$	$\frac{7}{16}$
$\frac{12}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{13}{16}$	$\frac{10}{16}$	$\frac{8}{16}$
$\frac{14}{16}$	$\frac{10}{16}$	$\frac{9}{16}$
$\frac{15}{16}$	$\frac{11}{16}$	$\frac{9}{16}$
$\frac{16}{16}$	$\frac{12}{16}$	$\frac{10}{16}$

Lining Pieces.

14. The space between the plating and the frames to have solid filling or lining pieces in one length, closely fitted ; to be of the same breadth as the frames, excepting in way of bulkheads, where they are to be fitted as stated in Section 22, paragraph 6.

RIVETING AND RIVETS.* (See also Table G 8.)

Section 21. 1. The landing edges of outside plating when $\frac{7}{16}$ of an inch in thickness and above from the keel to the upper turn of bilge, and of the sheerstrake in all cases ; and when $\frac{9}{16}$ of an inch and above from the upper turn of bilge to the gunwale, must be double riveted ; below these thicknesses the edges may be single riveted. In all cases the thicker of the two plates or angles is to regulate the size of the rivets and the requirements as to double riveting. When the plating is of a thickness amidships to require the edges to be double riveted, the same is to be continued all fore and aft. The stem, stern-post, keel, butts of outside plating, breasthooks, transoms, stringer and tie-plates on beams, also butts of keelsons, stringers, and all longitudinal ties, to be at least double riveted in all vessels.

2. The butts of outside plating to be chain riveted, also all double and treble riveting, except in the keel, stem, and sternpost.

3. In the butts of outside plating, a space equal to twice the diameter of the rivet to be between each row ; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

4. The overlaps of the edges and butts of plating to be of the breadth given in Table G 8.

5. The rivets are not to be nearer to the butts or edges of the plating, butt-straps, or of any angle bars than a space equal to their own diameter ; and in edge riveting the space between any two consecutive rows of rivets must not be less than once and a half their diameter.

6. The rivet holes to be regularly and equally spaced and carefully punched from the faying surfaces opposite each other in the adjoining parts, laps, lining pieces, butt straps, and frames ; and countersinking to extend through the whole thickness of the plate or angle bar. They are to be spaced not more than 4 diameters of the rivet apart from centre to centre in the butts of the outside plating, upper, spar, and middle deck stringer plates, and not more than from 4 to $4\frac{1}{2}$ diameters apart in the edges of the plating and at other parts, excepting in the keel, stem, and sternpost, where they may be 5 diameters, and through the keelsons, floors, frames, and reversed frames, frames and outside plating and the beam angles, where they may be 8 diameters apart from centre to centre. The rivets in the flanges of the gunwale angle bars to be spaced not more than $4\frac{1}{2}$ diameters apart from centre to centre ; and those connecting iron decks and stringer plates to the beams to be spaced from 7 to 8 diameters apart in each flange of the beam, in the butts of deck plating 4 diameters, and in the edges from 4 to $4\frac{1}{2}$ diameters apart.

7. The spacing of the rivets in the double angles of the flat plate keels is not to exceed 5 diameters.

8. For arrangements of rivets showing minimum number in each frame space in the edges of plating amidships, *see* Table G 8.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have the butt-straps double or treble riveted, as may be required by Section 20, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges.

9. There are not to be less than four rivets in each flange of the angle bars between the frames which connect the stringer plates and intercostal plates to the outside plating where the spacing of the frames from centre to centre is 23 inches and above ; but where the frames are closer spaced, there are not to be less than three rivets.

10. The rivets are to be of the best quality, and to be in diameter as per Table G 8, and to be increased in size under their heads to fill the rivet holes. When riveted up, the rivets are completely to fill the holes, their heads are to be "laid up," and their points or outer ends are not to be below the surface of the plating. Rudder rivets should be of not less size than required for the upper edge of the garboard-strake amidships, and spaced not more than five diameters from centre to centre. The plates to be countersunk, and the rivets to have full heads and points.

BULKHEADS.

Section 22. 1. Screw steamers, in addition to the engine-room bulkheads, to have a water-tight bulkhead built at a reasonable distance from each end of the vessel. In steamers 280 feet long and above, an additional bulkhead is to be fitted in the main hold about midway between the collision and engine room bulkheads, and extending to the upper deck in vessels with one, two, or three decks, and to the spar deck in spar-decked vessels, and to the main deck in awning-decked vessels; and in steamers of 330 feet long and above, an additional bulkhead is to be fitted in the after hold extending to the same height.

2. The foremost or collision bulkhead to be fitted at not less than half the midship breadth of vessel abaft the stem at the lower deck, and in all cases to extend from the floor-plates to the upper, spar, or awning deck, and its water-tightness is to be tested by filling the peak with water to the height of the load line.

3. When a bulkhead is not completed at one pair of frames from the floor-plate up to its prescribed height per rule, but is recessed, stepped, or stopped at an intermediate part, the water-tightness is to be completed with collars or chocks forming a "metal to metal" connection, to the exclusion of cement, wood, &c. The bulkheads to be connected to the decks and to double bottom plating by double angles of the size of the reversed frame.

4. The engine-room bulkheads to extend from the floor-plates to the upper deck, in vessels with one, two, or three decks ; and to the spar deck in spar-decked vessels, and main deck in awning-decked vessels. The aftermost bulkhead will be required to extend to the height of the upper or spar deck, unless a different arrangement of bulkheads be approved by the Committee. This bulkhead is to be made water-tight by a stuffing box where the screw shaft passes through, and its water-tightness is to be tested by the after compartment being filled with water to the height of the load line.

5. In sailing vessels the foremost or collision bulkhead only will be required.

6. All plating of bulkheads to be of the thickness prescribed in Table G 1, fitted between two frames at each side of the vessel and to be strongly riveted to them, and to be connected to the floor plates by a double row of rivets. Doubling plates between frames and outside plating in way of bulkheads, are to extend in one piece from the foreside of the frame afore to the aftside of the frame abaft the bulkhead frames.

7. The bulkheads to be supported vertically on one side and horizontally on the other, with angle bars of not less size than required for the main frames. The vertical angles to be not more than 2 feet 6 inches apart, and their lower ends to extend well down over the floor plates; or, where a double bottom is fitted, they are to be connected to the inner bottom plating by plate brackets. The horizontal stiffeners are not to exceed 4 feet apart, below where the bulkhead is supported by a laid deck, and, when of bulb angle, they are to be attached with brackets to the vessel's sides. In all collision bulkheads and other bulkheads of 40 feet and above in breadth, the horizontal stiffeners are to be of bulb angles, of the size required by Table G 4 for bulb angle beams under iron decks. All bulkheads of 36 feet and under 45 feet in breadth to be additionally stiffened by a vertical web at the middle line, extending from the keelson to the hold or lower deck beams. Bulkheads of 45 feet and under 55 feet in breadth to have 2 vertical webs, and bulkheads of 55 feet and under 60 feet in breadth to be fitted with 3 vertical webs.

8. In vessels of a depth to require lower deck, hold, or orlop beams, when the bulkheads are not supported on both sides by a lower or orlop deck, they are to be additionally supported by a semi-box beam of the scantlings required by Table G 4 for such beams; the same to be fitted in way of the hold or orlop stringer plate, or the side stringer midway between the floor plates and the lowest laid deck.

9. All such bulkheads to be caulked and made thoroughly water-tight.

10. When a recess extending above the hold beams is formed in the engine room bulkhead, the bulkhead is to be efficiently connected from side to side by tie or bridle beams, strongly riveted to the plating and fitted with efficient gusset plates.

DECKS.

WOOD DECKS.

Section 23. 1. The flat of decks, if of wood, to be of good quality, properly seasoned, free from sap and objectionable knots; the thickness and fastenings as per Table G 3.

2. Pine planks for weather decks should not be laid within a period of from four to six months (according to their thickness) after being cut; and where pitch pine is used for weather decks, the breadth of the planks should not exceed 5 inches, and the period of seasoning should not be less than six months.

3. Oregon pine of good quality will be admitted for decks of vessels, provided it be laid with the grain vertical, and the width of planks and period of seasoning be as required for pitch pine.

4. The above required periods of seasoning will not be necessary in cases where satisfactory artificial means of seasoning are adopted.

5. The Surveyors must ascertain that the requirement as to the seasoning has been complied with, and special attention should also be directed to the laying of the decks and to the caulking of the seams and rents.

6. In all cases the margin or boundary planks of weather decks in vessels intended for the 90A class and above, to be either Teak or Greenheart.

7. If the deck is of teak, the thickness to be as prescribed in Table G 3.

8. When the deck planks are 6 inches in width or under, single fastening will be sufficient; but when they are above 6 inches and not exceeding 8 inches in width, there must be 2 bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding 8 inches in width must be double fastened with nut and screw bolts.

9. The upper deck to be fastened by galvanised screw bolts with nuts at the under side of the angle bar of the beams and tie-plates. The bolts must be properly sunk, with oakum and white lead under their heads, and be carefully covered over with turned dowels bedded in white lead, marine glue, or some suitable composition.

10. Where diagonal plates are fitted on the beams, the deck planks to be scored over the diagonal plates, so as to fit close on the beams, thereby avoiding the use of wood pads.

11. When a deck originally required to be 4 inches thick is worn to 3 inches; $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches; 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

IRON DECKS. (See also Table G 5.)

12. Where iron decks are fitted $\frac{6}{16}$ of an inch in thickness and under, and no wood deck is laid on the same, beams of angle bar, or angle bulbs, of the sizes given in Table G 4, are to be fitted to every frame, except at the ends of the hatchways, where they are to be of bulb plate of the size required by the Rules for vessels of the same breadth having no iron deck. Where these angle bars or angle bulbs are fitted to every frame, a stringer is to be fitted at the middle line of the vessel to the under side of the beams, formed of double angles of the reverse frame size or tee bars of equivalent section connected by short angle lugs to the under side of the beams, to admit of the pillars being riveted to the same. This stringer is to be connected by angle lugs to all deep beams and bulkheads which it abuts against. Or any other approved web may be fitted.

13. Where iron decks exceed $\frac{6}{16}$ of an inch in thickness bulb beams may be fitted to alternate frames in the usual manner, but angle iron or angle bulb beams to every frame, except at the ends of hatchways, are considered preferable. Where no wooden deck is to be laid on an iron deck, angle iron or angle bulb half beams, of the size given in Table G 4, are to be fitted to every frame in the way of all hatchways, including those of engine and boiler openings.

14. When the deck plating is $\frac{7}{16}$ of an inch in thickness amidships it may be reduced $\frac{1}{16}$ of an inch before and abaft the half length amidships; when $\frac{8}{16}$ thick amidships, it may be reduced to $\frac{7}{16}$ for an eighth of the length before and abaft the half length, and the remainder to $\frac{6}{16}$ of an inch.

15. Where an iron deck is required to be fitted by the Rules, and is severed at the break, its continuity of strength is to be maintained by efficient brackets securely attached to the break bulkhead and to the deck plating before and abaft the same, or otherwise arranged to the satisfaction of the Surveyors.

16. If a wood flat be laid over an iron upper deck, the thickness should not be less than 3 inches if of pine and $2\frac{1}{2}$ inches if of teak, and it should be efficiently secured between the beams to the deck plating. Iron decks are not to be reduced in thickness from that given by Table G 5 when sheathed with wood.

17. In all cases iron decks, whether sheathed or not, are required to be caulked.

18. The butts of the iron deck to be double riveted for half the length amidships; and where large openings are cut in deck plating compensation is to be given for the same.

19. Where iron decks are fitted, as required by the Rules, additional strength is to be applied in way of all hatchways, either by increasing the thickness of, or doubling the plating, or by fitting plates of the breadth and thickness required for tie plates in Table G 5.

20. If a wood flat be laid over an iron middle deck it may be 2½ inches in thickness.

21. Where a vessel has an iron deck for half her length amidships, or beyond, but not a complete iron deck, or where there are one, two, or three iron decks; or one, two, or three iron decks, and in addition a partial iron deck, as before described, the same will be inserted in the Register Book thus—pt iron dk; 1 iron dk; 1 iron & pt iron dk; 2 iron dks; &c., &c., as the case may be.

DOUBLE BOTTOMS.

Section 24. 1. Vessels fitted with a double bottom for the purpose of water-ballast extending throughout the whole or part of the length of the vessel will have the same denoted in the Register Book, together with its length and capacity. (*See* Key to Register Book.)

2. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms; but where partial double bottoms are fitted, these keelsons are to extend into or scarph the double bottom not less than three spaces of frames, and be connected to the longitudinal girders where practicable.

3. "Manholes," with wrought-iron covers, must be constructed, or provision made for the removal of a portion of the plates so as to enable the inner surface of outside plating, the frames, floors, keelsons, and rivets to be thoroughly examined and coated when required, and in way of the manholes in the inner bottom plating, doubling plates or rims should be fitted to receive the fastening of the covers. The double bottom to be made water-tight, and all water-tight joints to be tested on completion with a head of water at least equal to the extreme draught of water of the vessel.

4. Where deep water ballast tanks are fitted their water-tightness is to be tested by a head of water not less than 8 feet above the crown of the tank.

5. A wash plate to be fitted in the peaks when used for water ballast, and the tank to be subjected to the test of a head of water of 8 feet above the crown, but not less in any case than the height of the load water line.

6. All water-tight joints to have the surfaces of iron fitted close to each other and caulked, without, as far as practicable, the use of felt, canvas, &c.

7. The upper side of the plating must be protected with wood planking as ceiling, in no case to be less than 2½ inches in thickness, the same to be laid on battens to admit of drainage water passing to the well.

8. Where a double bottom extends through the engine and boiler space, a well should be formed between the engine-room after bulkhead and the floor immediately before the same, for the drainage of water, or open gutter ways of sufficient size should be made in the wings, so as to be always accessible.

9. The ceiling on double bottoms to be removed when the tanks are required by the Rules to be tested.

10. It is of importance that ample provision should be made for the free passage of air from one division to another, so that it may readily find its way to the air pipes. This should be done by fitting the liners short, setting down the angle bar from the inner bottom or top of deep tank wherever necessary, and leaving, otherwise, a sufficient number of holes as near to the inner bottom as practicable The air pipes should also be sufficient in number and size; and, wherever necessary, one should be fitted at each end of each tank on both sides of the vessel.

11. No class will be assigned to vessels having a double bottom, or part double bottom, unless such

double bottom, or part double bottom, be constructed in accordance with the requirements of the Rules, or of strength equal to that prescribed thereby.

12. For record of double bottoms, &c., in the Register Book, see the Key to the Register Book.

Double Bottoms formed with Girders on top of Ordinary Floors.

13. Where double bottoms are fitted with longitudinal girders extending on top of ordinary floors, the inner bottom must be efficiently constructed and made water-tight; the plating of it not to be less in thickness than given in Table G 7, and the girders spaced not more than 3 feet. The double bottom to be efficiently connected to the outside plating and frames of the main body of the vessel; and when reversed frames are cut, they must be compensated for by doubling the frames with short angle bars of their own size. The butts of the flange-plate to be double riveted; the butts and edges of the remaining plates may be single riveted. The brackets outside the margin plate to be fitted to every frame and extend up the bilges to at least the same height as required for ordinary floors.

14. Where double bottoms are fitted in the fore and after holds and not extended through the engine-room, great care should be taken to provide against an abrupt termination in the longitudinal girders; they are either to be carried through the engine-room, or fully compensated for by connection with the longitudinal engine and boiler bearers, or otherwise, to the satisfaction of the Surveyor. The longitudinal girders to have a continuous angle on the upper and lower edges, and, in addition, to be connected by angle lugs on the floors and girders.

15. Where double bottoms, or part double bottoms, are fitted with longitudinal girders on the floors, all the outside plating (except the garboard strakes) which is entirely within the boundary of them may be $\frac{1}{16}$ of an inch less in thickness than that prescribed in Table G 2, provided that thickness be $\frac{10}{16}$ of an inch or above.

16. The height of the tank top above the floors to be sufficient for easy access and examination of the inside of tank.

Cellular Double Bottoms.

17. The scantlings, &c., of the various parts of the double bottom are to be as given in Table G 7.

18. In vessels whose plating number is 11,000 and under, triangular bracket plates of the thickness given in Table G 7 may be fitted at alternate frames; but under the engines, solid floor plates of the same thickness, lightened by manholes, and with double angle bars on the upper edge, are to be fitted at every frame, and at alternate frames under the boilers. Where the plating number exceeds 11,000, instead of bracket plates, solid floor plates lightened by manholes are to be fitted throughout the whole length of the double bottom. In all vessels where flat plate keels are adopted, and in vessels having hanging keels whose plating number is 18,000 and above, bracket plates are to be fitted to the centre girder at the intermediate frames, and where the plating number is 38,000 and under 51,000 the brackets at the centre girder and margin plate are to be of sufficient breadth at the top, to take three rivets in the vertical flange of the intermediate reversed angles, for $\frac{3}{5}$ the vessel's length amidships; and in all vessels bracket plates inside and outside the double bottom are to be fitted to the margin plate to every frame all fore and aft; and where the plating number is 38,000 and above, the bracket plates outside the margin plate are to be connected to it by double angles, for one-half the vessel's length amidships. The brackets

outside the margin plate to be fitted to every frame, and to extend up the bilges to the same height as required for ordinary floors. The vertical flange of the frame angles which are attached to the solid floors may be of the same size as the horizontal flange.

19. Intermediate angle bars are to be fitted for stiffening the inner bottom plating, unless the longitudinal girders are more closely spaced than given in Table G 7 and solid floors are fitted to alternate frames, when they may be dispensed with.

20. The keel should be formed by the vertical centre plate being extended down and riveted between two side bars, the three thicknesses to equal the thickness required for bar keels, or as otherwise approved.

21. The inner bottom plating to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and of the butts of the longitudinal girders, and the edges to be shifted well clear of the latter.

22. The butts and edges of the middle line strake all fore and aft, and also the butts of the inner bottom plating in the engine and boiler space, are in all cases to be double riveted. Where the plating number is 20,000 and under 30,000 the butts of the inner bottom plating are to be double riveted for half the vessel's length amidships. Where the plating number is 30,000 and under 38,000 the butts of the inner bottom plating, and the edges of an additional strake on each side of the middle line, are to be double riveted throughout. Where the plating number is 38,000 and under 51,000 the remaining edges of the inner bottom plating are to be double riveted for one-half the vessel's length amidships.

23. The butts of the side girders and margin plates are to be double riveted ; and in vessels whose plating number is under 21,000 the butts of the centre girder are to be connected by double butt-straps, double riveted. When the plating number exceeds 21,000 the butts are to be treble riveted, with the alternate rivets in the back row omitted. The double butt straps, in all cases, to be each not less than $\frac{2}{16}$ of an inch thicker than half the thickness of the plates they connect.

24. The rivets in the butts and edges of the inner bottom plating and in the butts of the girders are to be spaced not more than 4 diameters apart.

25. Manholes are not to be cut in the centre girder. The manholes in the floor plates, side girders, and inner bottom plating, are to be no larger and not more numerous than necessary to render all parts of the double bottom readily accessible. The edges of the manholes should be smooth to enable them to be entered with facility.

26. The bulkheads are to be connected to the inner bottom plating by double angle bars of the size required for the reversed frames, and to be caulked and made water-tight.

27. In this system of construction no reduction of thickness in the plating from the requirements of Table G 2 will be allowed where the floors are not spaced to every frame.

CELLULAR DOUBLE BOTTOMS HAVING CONTINUOUS FLOORS FROM CENTRE GIRDER TO MARGIN PLATES.

28. When double bottoms are constructed with solid floor plates lightened with manholes fitted to every frame, and continuous in one length from the middle line to the margin plate, the floor plates are to be connected to the centre keelson by double vertical angles of the size given in Table G 7 for half the length amidships where the plating number is 24,000 and above. Double vertical angles to be fitted in the engine and boiler space in all vessels. The scantlings are to be as given in Table G 7, and intercostal

plates are to be fitted about midway between the centre girder and margin plate, and well connected to the floors and to the inner and outer bottom plating. In way of the engines additional intercostal girders are to be fitted, the number of girders to be as required by Table G 7.

29. In vessels where the breadth from margin plate to margin plate at inner bottom is 34 feet and does not exceed 44 feet, two intercostal side girders will be required.

30. In this system of construction the outside plating (except the garboard strakes and flat keel plates), which is entirely within the boundary of the double bottom, may be reduced as hitherto admitted in double bottoms with ordinary floors.

31. Any other plan of fitting double bottoms may be adopted, provided in the first instance it receives the approval of the Committee.

CEILING.

Section 25. 1. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed. From the upper part of the bilges upwards, either batten and space or close ceiling may be adopted, but the former is considered preferable.

2. The ceiling on the floors should be made in hatches where practicable, of convenient sizes, and, when not so arranged, to be fastened to the reversed angle bars or frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

3. For thickness of ceiling, *see* Table G 3.

4. Vessels engaged *exclusively* in the coal trade will not be required to have cargo battens fitted.

ENGINE SPACE.

Section 26. 1. In steam vessels care must be taken that the engine and boiler bearers are properly constructed, having efficient longitudinal ties; and where the bearers may interfere with the longitudinal strength of the vessel, they must extend a sufficient distance beyond the bulkheads of the engine and boiler space to compensate for such interruption.

2. Where it is intended to fit engines of greater power than in ordinary cargo carrying steamers, the engine seating should be of proportionately greater strength, and be specially adapted with this object in view by being connected to the sides of the vessel; and other means adopted to ensure greater rigidity and strength to withstand the extra vibration produced in this part of the vessel. The after floor-plates should also be extended well above the screw-shaft, and the after lengths of outside plating attached to the stern-frame should be of not less thickness than the plates in the same range amidships. Great care should be bestowed in ensuring sound riveting and workmanship at this part; the after frames should be sufficiently apart transversely to admit of this being effected.

3. As many *upper*, *middle*, and hold or lower-deck beams of extra strength, having double angles at upper and lower edges of the sizes as per Table G 4, are to be introduced in the engine and boiler space as may be practicable. (*See* Section 14, paragraph 31.)

4. In the engine and boiler space, double reversed angles must be fitted to every floor, from bilge to bilge, and from margin plate to margin plate in vessels having double bottoms; and in vessels where the number for plating is 15,000 and above (excepting in way of double bottoms), or the depth from the top of keel to top of hold beams is 17 feet or above, they are to extend sufficiently high to admit of the bilge

stringer angles being riveted to them, unless the bilges are otherwise additionally strengthened by web frames, beyond the requirements of the Rules. Where the number is 16,000 and under 18,000 not less than three web-frames are to be fitted on each side, formed of plates of not less than the thickness of the frames, and of the breadth specified in Section 14a, and to scarph the ends of the floors, and extend to the upper or spar deck. Where the number is 18,000 and under 30,000, these web-frames are not to be more than from 8 to 10 feet apart, and where the number is 30,000 and above they are not to exceed 8 feet apart. The web-frames are to be fitted in way of the deck beams when practicable, and if fitted between the beams they are to be connected to the stringer plate by bracket knees above and below the same.

5. Where continuous bilge or side stringer bars pass through the web-frames efficient compensation to be introduced in way of the same.

6. When hold beams are omitted in the engine and boiler space the web-frames are to be closer spaced than above described.

7. Where it is desired to adopt other plans than the foregoing for maintaining the necessary rigidity in the engine and boiler space, sketches of the same must be submitted for the approval of the Committee.

SHAFT TUNNEL.

8. The plating of shaft tunnels to be of the thickness required in Table G 1 for the lower half of bulkhead plating: the top plating in way of the hatchways to be not less than $\frac{2}{16}$ of an inch thicker than the remaining plates, or to be covered with wood not less than two inches thick. The tunnel to be additionally strengthened with transverse angle bars not more than 4 feet apart, and 3 feet in way of hatchways, of the size of the reversed frames, and the plating to be caulked, and the tunnel to be tested with water to ensure its being water-tight. The recess bulkhead and the top plating to be strengthened and supported by similar angles, but spaced the same as the vessel's frames: the top plating where attached to the sides of the vessel to be made water-tight with iron collars or chocks, to the exclusion of wood or cement. The tunnel to be fitted with a water-tight sluice door on the engine-room bulkhead capable of being closed from the upper deck.

COCKS, VALVES, AND SOIL PIPES.

Section 27. 1. A sluice valve or cock is to be fitted at the limbers, to engine-room bulkheads, and also to after bulkheads when the after peak is not used as a water-ballast tank, to allow water to be shut off, or to reach the pumps when required. The same to be at all times accessible and fitted so as to be controlled above the load water line, and to be boxed in to prevent injury. No sluice valve or cock is to be fitted to the collision bulkhead.

2. The shut-off valves or cocks of all openings for the inlet or outlet of water, in connection with the engines and boilers, are to be fitted close to the vessel's sides and are to be accessible at all times.

3. All head and stern pumps to be efficiently provided with stop cocks, to the satisfaction of the Surveyors.

4. Where soil pipes are attached to the outside plating below the load water-line, the lower length must be of steel or iron of substantial thickness, and be secured to the plating with a proper faced joint, and extended for some distance above the load water-line.

5. If the remainder of the pipe be of lead, care must be taken that it be of substantial thickness and that it be properly protected externally with either zinc or iron, to the satisfaction of the Society's Surveyors.

HATCHWAYS AND MAST PARTNERS.

Section 28. 1. All hatchways are to be properly framed to receive half-beams where required, and the mast-holes to have partners at the upper deck and at the tier of beams where the masts are wedged, the plating of which is not to be less in thickness in any case than is required for stringer plates amidships, excepting in steamers where iron decks are fitted, and the united breadths of the plates are not to be less than twice the diameter of the masts. At the decks where the masts are to be wedged, an angle bar having the vertical flange not less than one inch deeper than required for the main frame of the ship, is to be fitted and riveted round the plate to the mast-holes.

2. A large angle bar is to be fitted on the beams where coamings are to be fitted, of sufficient size to compensate for double angles, the angle bar to be on the side of the beam that will be clear of the hatchway space. Plates are to be fitted and riveted to these beams, where necessary, in order that the ends of the deck may be properly fastened ; and the coaming plates at sides of hatchways are to be connected to plates of the thickness required for tie-plates.

3. Where upper deck hatchways are 12 feet and not exceeding 16 feet in length, strong shifting beams are to be fitted with proper means for firmly securing the same. Where the length is above 16 feet and not exceeding 20 feet, a deep web-plate is to be fitted between double angles, at the middle of the length, extending the depth of the coamings and carlings ; and the fore and aft tie-plates in way of the same, and extending two spaces of beams beyond each end of the hatchway or opening, are to be double the width of that given in Table G 5, or such other arrangement as may be considered equal thereto may be adopted if approved by the Committee. When the length exceeds 20 feet a deck plan is to submitted for the approval of the Committee, showing the necessary additional transverse strength proposed to be applied, by increasing the number of web-plates, and either increasing the width of the stringer and tie-plates or by plating the beams in way of the same, as the case may require. Where iron decks are fitted as required by the Rules, additional strength is to be applied in way of all hatchways either by increasing the thickness of, or doubling, the plating, or by fitting plates of the breadth and thickness required for tie plates in Table G 5.

4. All hatchway coamings on weather decks and the companions at the fore-end of steamers to be of iron.

5. In all cases where half-beams are fitted, fore and aft carlings of the same size and description as the hatchway beams, are to be fitted in the hatchway spaces ; the plates forming the coamings and head ledges are to be of sufficient strength in proportion to their size, and are to extend to the lower edge of the beams and carlings, and must be riveted to them, excepting that when the beams are of bulb plate they may then terminate on the bulb ; where coaming plates are of extra thickness the carlings may be dispensed with. (*See* sketches after page 79.)

6. Half beams are to be fitted to alternate frames where a wood deck is fitted, and to every frame under an iron deck, between the hatchway beams, and their ends to be efficiently secured to the fore and aft carlings or coamings. In addition fore and aft tie-plates are to be fitted close to the coamings and riveted to the beams and half beams. An angle bar with its flange of sufficient depth to extend half an

inch above the deck is to be fitted and riveted to the coamings and head-ledge plates, and to the beams and tie-plates; its upper edge to be properly caulked, and the rivets used in its vertical flange to be countersunk and flush-headed.

7. In vessels having long hatchways for the purpose of "self-trimming," wing boards are to be fitted to the approval of the Committee, to prevent the shifting of cargo.

8. The hatches of sailing vessels of 500 tons and above, and of all steamers, to be solid, not less than $2\frac{1}{2}$ to 3 inches in thickness.

ENGINE AND BOILER OPENINGS.

Section 29. 1. The engine and boiler openings of the weather deck of steam vessels are to be properly framed for a height of not less than 18 inches above the deck, the coaming plates to extend to the lower edge of the beams, and iron trunk bulkheads connected to the coamings should be fitted to a height of about 7 feet above the deck; except in Awning and Partial Awning deck vessels where the height of the casing need not exceed 4 feet 6 inches above the deck, provided suitable iron covers be fitted, and the openings have coamings on the top of the casings not less than 9 inches in height; the thickness of the same, where exposed, to be not less than that required for the side plating of poops, and to be efficiently stiffened by vertical angles of the size of the reverse frames 30 inches apart, connected to the coaming plates. The thickness of the coamings to be $\frac{1}{16}$ of an inch more than required for the trunk bulkheads. Where the trunk bulkheads are enclosed by a complete bridge-house extending to the sides of the vessel, and efficiently protected from the force of the sea, a reduction from the above thickness might be admitted, provided in such cases a plan showing the proposed arrangement be furnished for approval. (*See* sketches after page 79.)

2. The engine and boiler openings in the 'tween decks of all vessels are also to be enclosed by trunk bulkheads efficiently stiffened by angle bars 30 inches apart, and extending to the weather deck beams, to which they are to be secured.

3. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least 18 inches above the deck, and efficient arrangements made for their security.

4. When a poop, or bridge-house, covers the engine and boiler space, the coamings of the engine and boiler openings should not be less than 2 feet above such deck, unless these openings are constructed as provided for in the first paragraph of this section.

5. It is considered that in all cases the engine and boiler openings should be made as small as practicable, and be subdivided by athwartship iron divisional casings to secure the maximum safety of the vessel. The two sides of the casing should in all instances be efficiently connected by angle beams within them at the upper part.

6. The engine-room skylights are to be in all cases substantially constructed and to be securely bolted or riveted to the coamings, and where the skylight top is not solid with bull's eyes fitted in the same, efficient deadlights of metal or wood must be provided. The grating openings over the stokehold must also be protected by plates, fitted with hinges, or otherwise in a manner satisfactory to the Surveyors.

7. Where either of the openings exceed 15 feet, or the combined length exceeds 30 feet, the beams in way of the same are to be plated over from the stringer to the tie-plates, the plating extending two

beam spaces beyond the openings, and tapered from thence towards the stringer plate for a distance not less than the breadth of the plating required to be fitted; the thickness of this plating to be the same as given in Table G for iron decks.

8. Where large openings are adjacent to each other, the intervening space between the hatchways to be plated over.

COAL BUNKER PIPES AND LIDS.

Section 30. Coal bunker pipes, where practicable, are to be formed so as to be at least 12 inches above the upper deck, fitted with lids having studs to fit in openings made in the pipes, for their security; the pipes to be so formed that tarpaulin may be securely lashed over them. Where there are coal bunker hatches in the weather deck they must be properly framed with coaming plates of suitable height having solid hatches secured by an iron bar or other approved fastening.

PORTS AND SCUPPERS.

Section 31. 1. All vessels must be fitted with a sufficient number of ports and scuppers, to readily discharge any large quantity of water from the upper deck. The ports and flaps, where such are adopted, are to be hung by strong hinges with yellow metal pins, and the scuppers formed in the vertical flange of the upper deck stringer angle bar, which is to be increased in depth so as to enclose the scuppers; or any other equally efficient plan may be adopted.

2. Where the bulwark plating and main rail are cut through to form a cargo port, the bulwark stays at each end of the port should be of increased strength, to the satisfaction of the Surveyors.

3. A sufficient number of scuppers, with proper pipes attached to them, are to be fitted in all 'tween decks to convey water or leakage to the bilges.

4. In Well deck vessels the freeing port area in the "Well" should be in accordance with the following table :—

Length of Bulwarks in "Well," in feet.	Freeing Port Area on each side, in square feet.
30	9·5
35	10·0
40	10·5
45	11·0
50	11·5
55	12·0
60	12·5

65 and above, 1 square foot to each 5 feet length of bulwarks.

VENTILATORS.

Section 32. 1. It is recommended that ventilators, sufficient in number and size, be efficiently fitted to the upper deck of all vessels.

2. When scuttles are fitted for ventilation in the topsides of vessels, strong covers for them are to be provided; these covers to be efficiently fitted, to the approval of the Surveyors.

3. Where scuttles are fitted in the sheerstrake within three-fifths of the vessel's length amidships, compensation is to be given either by an extra thickness in the sheerstrake, doubling plate in way of the scuttles, or else by the introduction of strong angle bars over them.

CHAIN PLATES.

Section 33. The chain plates to be in proportion to the size of the vessel, and riveted efficiently to the outside plating (not bulwark plating), the sheerstrake being preferable.

BITTS.

Section 34. All bitts, when not of steel or iron, and which do not go down to the deck below, to be fitted into proper sockets fastened through the deck to plates riveted to the beams.

CEMENT.

Section 35. 1. The frames and plating of the bottom of all vessels to the upper parts of the bilges to be thickly and efficiently covered with Portland or other approved cement, which may be mixed with sand or other suitable substance. Care to be taken to have a proper substance of cement at its termination, and to keep the watercourses clear all fore and aft. The whole to be to the satisfaction of the Surveyors.

2. Where asphalt, enamel cement, or similar compositions are to be used, the same must be sanctioned by the Owners, and samples are to be submitted for the approval of the Committee.

3. The condition of such compositions is to be ascertained by the Society's Surveyors biennially, and vessels coated with compositions as above described will be distinguished with a record of "Asp." in the Register Book.

RUDDER.

Section 36. 1. The rudder to be made to ship and unship while the vessel is afloat. The size of main piece, given in Table G 3, to be regulated by the number which regulates the thickness of the vessel's plating ; it is to be of the best hammered iron or steel. In cases where the rudder is exceptionally large, or where the vessel is built to attain a high speed, the diameter of the rudder head should be increased beyond that given in Table G 3. It is also recommended that the stops on the steam steering engines should be fitted at a smaller angle than the stops on the rudder, in order to prevent excessive strain through the rudder being forced against the stops. The frame of the rudder and main-piece to be one forging ; the rudder to be stayed at intervals corresponding with the pintles. (*See* also Section 42, paragraph 16.) The plating to be of the thickness given in Table G 1 for the lower half of bulkheads, and where practicable these plates should be in one length. The plates to be countersunk, and the rivets to have full heads and points. It is recommended that the pintles be made independent of the frame. They should be spaced not more than from 4 feet to 5 feet 6 inches, and the upper one should be placed as near as practicable to the rudder trunk, and the rudder plates should be secured to the frame with rivets of not less size than required for the upper edge of the garboard strake amidships, and spaced not more than five diameters from centre to centre. All vessels to have a spare tiller and gear ready for use if required.

2. Solid cast steel rudders of approved manufacture, and satisfactorily tested, and single plate rudders will be admitted if the particulars be in the first instance submitted to and approved by the Committee.

3. The tests of cast steel rudders to be as follows :—A tensile test is to be made on a piece taken from each casting, and the extension on a length of 8 inches is not to be less than 8 per cent., and the tensile strength not less than 28 tons, nor more than about 35 tons per square inch. A cold bending test also to be made corresponding to each tensile test, and the sample to bend cold before fracture through an angle of at least 90°.

The rudders to be dropped from a height of from 7 to 10 feet, according to the design, shape, and weight of the casting. The casting in each case to be subsequently slung up and well hammered with a sledge hammer, not less in weight than 7 lbs., to satisfy the Surveyors that the castings are sound and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

WINDLASS AND HAWSE-PIPES.

Section 37. 1. The windlass, for all grades, if of wood, may be composed of any of the following timbers; namely, English, African, or Live Oak; Adriatic, Italian, Spanish, Portuguese, or French Oak; East India Teak, Morung Saul, Greenheart, Morra, or Iron Bark. The iron or steel spindle in all cases to pass through the body of the windlass.

2. The hawse-pipes must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass or capstan.

PUMPS.

Section 38. 1. In Steam Vessels the pumping arrangements according to the division of holds, &c., to be as follows:—

2. **Holds with double bottoms.**—In the double bottom of each compartment of the hold and of engine and boiler space, a steam pump suction is to be fitted at the middle line, and one on each side to clear the tanks of water when the vessel has a heavy list. Where there is considerable rise of floor towards the ends of vessels, the middle line suction only will be required. A steam pump suction and a hand pump are also to be fitted to each bilge in each hold where there is no well. When there is a well, one or three steam pump suctions are to be fitted in the same according as there is considerable or little rise of floor, and hand pumps fitted at the bilges.

3. **Holds without double bottoms.**—Where there is considerable rise of floor, one steam pump suction and one hand pump are to be fitted in each hold. In vessels with little rise of floor, two or three steam pump suctions and at least one hand pump to be fitted to each hold.

4. **Engine and Boiler space.**—Where a double bottom extends the whole length of engine and boiler space, two steam pump suctions are to be fitted to the bilge on each side. Where there is a well one steam pump suction should be fitted in each bilge and one in the well. Where there is no double bottom in the machinery space, centre and wing steam pump suction should be fitted. The rose box of the bilge injection is to be fitted where easily accessible, and is to be used for bilge water only. The main and donkey pumps to draw from all compartments, and the donkey to have also a separate bilge suction in the engine room.

5. **Fore and After Peaks.**—If the Peaks are fitted as water ballast tanks, a separate steam pump suction is to be led to each. If not used for water ballast, an efficient pump is to be fitted in the fore peak.

6. **Tunnel.**—The Tunnel well is to be cleared by a steam pump suction.

7. **All Hand Pumps** to be capable of being worked from the upper or main decks above the deep load water line.

8. **No Sluice Valves** are to be fitted which are not at all times accessible.

9. **Sounding Pipes** to be fitted on each side of holds and ballast tanks, and a doubling plate is to be fitted under each.

10. **Air Pipes** to be fitted to each ballast tank as required.

11. In addition to the engine pumps in steam vessels, an efficient pump is to be fitted in the bilges, on each side of the vessel, to each cargo compartment, for clearing the bilges of water when the vessel has a list, and to be capable of being worked from the upper or main deck; or such other arrangement may be adopted as may, when submitted to the Committee for their approval, be deemed satisfactory by them. An efficient pump is to be fitted in the fore peak. A doubling plate should be fitted under all sounding pipes.

12. All **Cocks** and **Valves** in connection with bilge and ballast suction pipes are to be fitted in places where they are at all times accessible.

13. The **Pipes** for bilge or ballast suctions are to be fitted with flanged joints in convenient lengths, so that they may be easily disconnected for clearing. In the case of cast iron suction pipes, which are not also used as tank filling pipes, or which cannot be subjected to sea pressure, spigot and faucet joints made with india-rubber rings fitted over the spigots might be adopted, except in the case of bilge suction pipes passing through ballast tanks, which should be fitted with flanged joints.

14. The **Suction Pipes** to fore and aft peaks, and to the tunnel well, should not be less than $2\frac{1}{4}$ inches inside diameter, except in vessels under 500 tons under deck, in which case they may be made 2 inches.

15. The **Bilge Injection** should not be less than two-thirds of the diameter of the sea inlet to the circulating pump.

The inside diameter of other bilge suction pipes should not be less than given in the following Table :—

Tonnage under Upper Deck.	Engine Room Centre Suction, Separate Donkey Suction, and Hold Centre Suctions.	Wing Suctions in Holds where no Centre Suctions are fitted, and Wing Suctions in Engine Room.	Wing Suctions in Holds where Centre Suctions are also fitted.
	Inches.	Inches.	Inches.
In vessels under 500 tons	2	2	2
„ 500 tons but under 1000 tons ...	$2\frac{1}{4}$	2	2
„ 1000 „ „ 1500 „ ...	$2\frac{1}{2}$	$2\frac{1}{4}$	2
„ 1500 „ „ 2000 „ ...	3	$2\frac{3}{4}$	$2\frac{1}{4}$
„ 2000 „ „ 3000 „ ...	$3\frac{1}{2}$	3	$2\frac{1}{2}$
„ 3000 tons and above	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{4}$

In cases where more than one suction to any one compartment are connected to the pumps by a single pipe, this pipe should be not less than the size required for the centre suction.

EQUIPMENT.

Section 39. 1. All vessels are required to have their masts, spars, and rigging in good order, and sails in sufficient number and in good condition.

2. Every ship is to be provided with anchors, cables, &c., of approved quality, in number and length as set forth in Table No. 22, tested at a *public machine* recognised by the Committee.

3. To entitle vessels classed A "For Channel Purposes" to the Figure 1, the equipment of Anchors and Chain Cables, &c., should be as required by Table 22, with the exception that not more than two bower anchors need be supplied, the first bower being of the greatest weight given in the table, and the second bower 15 per cent. lighter, the stream anchor only being required.

4. In vessels, however, engaged for more extended voyages, such as the Queenboro' and Flushing service, or the Channel Islands or Irish Sea, the equipment must be in accordance with the requirements of Table 22.

5. In cases, however, where anchors and chain cables are manufactured abroad and supplied to *foreign owned vessels*, and testing certificates are furnished setting forth that the anchors and chain cables have been tested at a Government machine, or a machine under the control of a municipal body, or a similar responsible body, such certificates will be accepted as complying with the requirements of the Rules for obtaining the figure 1, provided the remaining requirements of Table 22 be complied with, but in these cases the record of A.&C.P. will not be made in the Register Book.

6. A certificate of all chains and anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the Figure 1.

7. The equipment as regards anchors, chains, warps, &c., is to be regulated by the number produced by the sum of the measurements in feet arising from the addition of the half moulded breadth of the vessel at the middle of the length, the depth from the upper part of the keel to the top of the upper deck beams, with the normal round up, and the girth of the half-midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate, multiplied by the length of the vessel for a one, two, and three-decked vessel, and for a spar-decked vessel. For a vessel having a complete awning-deck, or a continuous shade deck, the equipment number is to be increased one-eighth beyond that given by the measurements defined above to the main deck.

8. For a steam vessel with a partial awning deck, poop, top-gallant forecastle, bridge-house, or a raised quarter-deck, the equipment number is to be increased beyond that for a flush or spar-decked vessel by that proportion of the addition made for a complete awning-deck which the combined length of the erections bears to the length of the vessel.

9. All vessels under 150 tons to be provided with one good boat; and every vessel of 150 tons, and above, to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels.

10. **Anchor Cranes** and **Boats' Davits** to be in accordance with Table 12, at end of the Rules for Iron Vessels.

11. In steam vessels, the boilers and machinery are to be considered as part of the equipment, and unless the Surveyors are satisfied of their efficiency the Figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting, a class to which the hull of a vessel may be found entitled will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules. (*See* page 57.)

12. The efficient state and condition of the whole of the ship's equipment will be designated by the Figure 1; and where the same is found insufficient in quantity or defective in quality, by a dash thus — following the character assigned to the ship.

DEFECTIVE EQUIPMENT.

13. In the case of a steam vessel already classed of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the Figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the Figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel in the Register Book; but where in the opinion of the Committee the machinery or boilers are deemed so far inefficient or defective as to imperil the vessel's safety, the Figure 1 will be withheld, and a red ring inserted in place thereof; and in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the Figure 1 for equipment, as described in the Key to the Register Book.

REPORTS ON VESSELS.

Section 40. 1. The Surveyors, in submitting their Reports of vessels not already classed, are in all cases, where practicable, to forward a sketch of the midship section, and other drawings where necessary, to be furnished by the builders, with figured dimensions of the component parts marked thereon.

2. Builders wishing to adopt plans other than those described herein, are to submit them through the resident Surveyors (who are to state their opinions thereon) for the Committee's consideration and approval.

"THREE-DECK" STEAM VESSELS.

Section 41. 1. Steam vessels not less than 17 feet depth from top of keel to the middle deck, having two or more complete decks laid and caulked, and a tier of hold beams, or extra strong beams, of web-frames and stringers in lieu thereof, will have their scantlings determined as follows:—Such vessels to be denoted in the Register Book, "3Dks," or "2Dks3trB.," or "2Dks&web frames," as the case may be.

2. The scantlings and spacing of the frames, reversed frames and floor-plates, the thickness of bulkheads, and diameter of pillars, are determined by the number produced by the deduction of *seven feet* from the sum of the measurements in feet arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the *upper deck beams*, with the normal round-up, at the middle of the vessel's length, and the girth of the half-midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate.

3. The scantlings of the keel, stem, sternpost; the thickness of the outside plating, keelson and stringer plates, and deck; also the scantlings of the angle bars on beam stringer plates, and keelson and stringer angles in hold, as in Tables G 2, G 3, and G 5, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

4. All the frames are to extend to the upper deck stringer plate.

5. The reversed frames are to extend to the upper part of the middle deck beam stringer angle, and to the upper part of the frames alternately.

6. The plating to be of the thickness given in Table G 2 from the keel to the gunwale; the sheerstrake to be placed at the gunwale, and the strake of plating in way of the middle deck to be an outside strake.

7. The upper and middle deck stringer plates to be of the breadth and thickness prescribed in Table G 5. The middle deck stringer plate to be fitted and connected to the outside plating by angles between the frames of the size given for beam stringer angles; and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angles on each frame, and to the stringer plate, the space between this angle bar and the outside plating, all fore and aft, to be filled in and made water-tight. Similar angle bars are to be riveted to the stringer plate, reversed frames, and outside plating, at the lower deck stringer.

8. The butt-straps of the sheerstrakes and upper middle deck stringer plates, and of not less than three strakes of plating at the bilge, to be $\frac{1}{16}$ of an inch thicker than the plates they connect, and to be treble riveted for not less than half the vessel's length amidships, and otherwise as per Section 20.

9. In these vessels a side intercostal keelson is to be fitted and attached to the outside plating by angle bars of not less size than $3 \times 3 \times \frac{7}{16}$; but if the plating number is 21,700 or above these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

10. The thickness of the flat of upper deck is to be as given in Table G 3. In all cases a middle deck is to be properly laid and caulked, the thickness of which may be one-half inch less than that prescribed for the upper deck.

11. Engine room hatchways on the middle deck are to be enclosed by iron trunk bulkheads, efficiently strengthened, and extended from the middle deck to the upper deck, as prescribed in Section 29.

12. If in such vessels the length exceeds *eleven* times the depth taken from the *upper part of the keel* to the top of the *middle deck beams*, additional strength will be required at the bilge and bottom, as per Table G 6; but no additional strength at the sheerstrake and stringer plate will be needed until the length exceeds *eleven* times the depth taken from *the upper part of the keel* to the top of the *upper deck beams*; when this is the case, additional strength will be required in the *upper deck* sheerstrakes and stringers, as per Table G 6 relating to vessels' proportions.

SPAR-DECKED STEAM VESSELS.

Section 42. 1. Vessels noted in the Register Book as "Spar-deck" are those which are of lighter construction * than vessels built under the "Three-deck" rule, having the same dimensions, taken with reference to the total depth to the spar or upper deck in either case.

2. They must have three tiers of beams and be not less than 17 feet depth from top of keel to the main deck. The Committee, however, will approve of the construction of Spar-deck vessels having a somewhat less depth of hold provided the plans be in the first instance submitted for approval. For such vessels, having less than 17 feet depth from top of keel to the main deck, a minimum freeboard must also be submitted to the Committee for approval, and the freeboard sanctioned is to be inserted in the Certificate and in the Register Book and marked on the ship's sides.

* This does not necessarily imply that the vessel is of less strength in relation to the amount of dead-weight carried at a suitable load line.

3. In cases where erections are required on the spar deck, plans must be submitted showing the additional strengthening proposed, which must be to the satisfaction of the Committee.

4. In such vessels the scantlings and arrangements are to be regulated by the dimensions under the main deck, as in those having one or two decks.*

5. *All* the frames must extend to the spar-deck stringer plate.

6. The reversed angle bars on the frames are to extend to the upper part of the main deck beam stringer angle, and to the upper part of the frames, alternately.

7. The main and spar deck sheerstrakes, and the plating between them, to be in thickness as prescribed in Table G 2. The riveting of the butts of the plating between these sheerstakes to be regulated by Section 19, paragraph 11, and Section 20.

8. A reduction of $\frac{1}{16}$ of an inch from the thickness required by the upper line of Table G 5 for stringer and tie-plates will be allowed for those of the spar-deck.

9. The butt-straps of the spar and main-deck sheerstrakes and stringer plates, and of not less than three strakes of plating at the bilges, to be $\frac{1}{16}$ of an inch thicker than the plates they connect, and to be treble riveted for at least half the vessel's length amidships, and otherwise as per Section 20.

10. In these vessels a side intercostal keelson is to be fitted and attached to the outside plating by angle bars of not less than $3 \times 3 \times \frac{7}{16}$; but if the plating number is 21,700 or above, these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

11. The lower edge of the main sheerstrake must not be more than one-half its depth below the main-deck stringer plate.

12. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle bars between the frames, of the size given for beam stringer angle bars, and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angle bars on each frame, and to the stringer plate; the space between this angle bar and the sheerstrake, all fore and aft, to be filled in and made water-tight. Similar angle bars are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck.

13. These vessels are to have a complete main deck $3\frac{1}{2}$ inches in thickness laid and caulked.

14. The flat of spar deck to be not less than $3\frac{1}{2}$ inches in thickness.

15. Engine-room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened and extended from the main deck to the spar deck. (*See* Section 29.)

16. The diameters of rudder heads and pintles to be regulated by the number which regulates the plating of a three deck vessel of the same dimensions. (*See* also Section 36.)

17. The measurement of depth, for regulating the additional strength required for vessels of extreme proportions is to be taken from the upper part of keel to the top of the *main deck beams*.

18. When Table G 6 applies to these vessels, the increased strength defined for sheerstrakes is to be added to those of either the spar or main deck.

19. They are to have extra strength at the bilge and bottom in the proportion of their length to depth from main deck as prescribed in Table G 6; they may, however, be 13 and under 14 depths in length

* Where the height between the main and spar deck stringers at the sides is eight feet or above at any part additional transverse strength will be required to the satisfaction of the Committee.

before they are required to have the remaining extra strength prescribed for vessels of 11 to 12 depths in length, and such vessels exceeding the above proportions to have extra strength in the same relation to that prescribed for one and two-decked vessels.

20. Vessels to which this rule applies will be noted in the Register Book thus:—"*Spar dk.*"

AWNING-DECKED STEAM VESSELS.

Section 43. 1. An awning-decked vessel is one having a comparatively light superstructure fore and aft on the main deck proper of the vessel, intended to shelter passengers or cattle, or for the conveyance of cargo either light in its nature or limited in quantity. In such vessels the scantlings and arrangements of the frames, reversed frames, the thickness of bulkheads, and diameter of pillars in Table G 1, are to be regulated by the dimensions under the main deck, as in a one or two-decked vessel, exclusive of the awning deck.

It is a condition on which an awning-decked vessel is classed in the Society's Register Book that the freeboard assigned shall be marked on the vessel's sides as hereafter described. If the vessel be loaded to a greater draught of water than that assigned by the Committee, or if the mark indicating the maximum load draught be placed higher than the position assigned by the Committee, the vessel will thereby forfeit her Character in the Register Book.

2. The plans of such vessels and a minimum freeboard must be submitted to the Committee for approval, and the freeboard thus sanctioned is to be inserted in the Certificate and in the Register Book, and marked on the ship's sides.*

3. Awning-decked vessels loading to a greater draught of water than thus indicated will thereby lose their character in the Register Book.

In the case of an awning-decked vessel which for any reason has forfeited her character, the freeboard assigned as a condition of classification will be omitted in reprinting the Register Book, unless the character be previously reinstated.

4. Vessels to which this rule applies, as regards an entire awning deck, will be noted in the Register Book thus, "*Awng dk.*"

5. Such erections only as are necessary for navigating these vessels will be allowed on the awning deck, unless plans are submitted to, and approved by, the Committee.

6. All the main frames must extend to the awning-deck stringer plate, or to the lower part of the curve when of a rounded form at the gunwale. To be of the size given in Table G 1, but in no case to be less than $3 \times 3 \times \frac{6}{16}$.

7. The whole of the reverse frames are to be extended to the top of the main-deck stringer angle bar.

8. All the side plating above the main sheerstrake to be not less than as given in Table G 2.

9. The awning-deck stringer plate to be of the breadth given in Table G 5 for hold beam stringers, and of the following thicknesses, namely:—

In vessels whose plating number is under 14,000, not less than $\frac{6}{16}$ of an inch.
" 14,000 and under 26,400, " $\frac{7}{16}$ "
" 26,400 " 30,900, " $\frac{8}{16}$ "

* See Notice of Freeboard requirements printed at end of Rules.

When the number for plating exceeds 30,900, or the vessel exceeds thirteen depths in length to the main deck, special arrangements must be made for affording the requisite longitudinal strength at the gunwale, to the satisfaction of the Committee.

10. The tie plates to be of the same thickness as given above for the stringer plates, and to be in breadth as in Table G 5 for main deck tie-plates.

11. The butts of the awning deck side plating above the main deck, and of the awning-deck stringer and tie-plates, are to be double riveted.

12. A reduction of one fourth from the thickness prescribed for the main deck will be allowed for the flat of awning deck.

13. The beams to be of the sizes given in Table G 4. They are to be placed at every alternate frame, and, if the vessel is of a rounded form at the gunwale, to scarph the main frames not less than eighteen inches, and to be properly riveted to them. For diameters of pillars *see* Table G 1.

14. These vessels are to have a complete main deck laid and caulked, and coamings and hatches fitted as to a weather deck.

15. Engine room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened and extended from the main deck to the awning deck. (*See* Section 29.)

16. Rounded gunwale plating to be not less in thickness than required for the awning deck stringer plate, and to have a gunwale angle bar of the size required by Table G 3.

17. The gunwale must be properly constructed to the satisfaction of the Surveyors.

18. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle bars between the frames, of the size given for beam stringer angles; and, in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angles on each frame, and to the stringer plate; the space between this angle bar and the sheerstrake, all fore and aft, to be filled in and made water-tight.

POOPS, FORECASTLES, AND BRIDGE HOUSES.

Section 44. 1. In full poops, forecastles, and bridge-houses, a reduction of one-fourth from the dimensions which would be required in the same range if the vessel were flush-decked (exclusive of additions for extreme proportions) will be allowed in the outside plating, stringer and tie-plates upon beams, angle bars on stringer plates, and flat of deck. The side plating need not exceed the thickness required for awning-decked vessels. The butts to be double riveted.

2. All frames to extend to the poop or forecastle stringer plate, or to the lower part of the curve when of a rounded form at the gunwale, and a continuous angle bar of the size given for the upper deck stringer angle is to be wrought on the upper deck stringer plate inside the frames, as prescribed in Section 16, paragraph 7. The beams to be of the size given in Table G 4, and they are to be efficiently pillared. A beam to be placed at every alternate frame to scarph the main frames not less than eighteen inches, and to be properly riveted to them.

3. The rounded gunwale plating may be of the thickness required for the poop or forecastle stringer plates. The gunwale must be properly constructed to the satisfaction of the Surveyors.

4. Bulkheads at the fore end of long poops and long bridge houses to be of the thickness of their side

plating, with coaming plates $\frac{1}{16}$ of an inch thicker than their bulkheads, and to be stiffened with bulb plates of not less size than those required for forecastle beams, and angles of the size required for the vessel's reverse frames, spaced 30 inches apart, and connected both to the coaming plates and to the deck plating, or to an athwartship plate on the beams both below and above, with a bracket-plate to each end of the bulb stiffener ; or other equivalent strength introduced.

5. Bulkheads at the fore end of short poops and bridge houses, to be of the thickness of their side plating, with coaming plates $\frac{1}{16}$ of an inch thicker, and to be stiffened with angle bars the size of the frames spaced 30 inches apart.

6. The bulwark plating at the fore and after ends of the bridge to be increased in thickness and supported by bracket knees, and the freeing ports at this part should, in order to preserve a continuity of strength, have rounded corners and a substantial rim.

7. Where the poop exceeds one-fourth of the vessel's length, the sheerstrake is to be doubled, and the upper deck stringer plate increased in thickness in way of the break, for a length of from 20 to 30 feet, at this part, to the satisfaction of the Surveyors.

8. In top-gallant forecastles of vessels whose plating number is 18,000, and above, the alternate reversed frames are to extend to the forecastle deck, or a double angle stringer of the size required for reversed frames is to be fitted inside the frames midway between the upper and forecastle decks, connected at the fore-end by an efficient breasthook ; or other equally efficient means of strengthening the forecastle may be adopted, if approved by the Committee.

9. Where it is proposed to fit a poop or top-gallant forecastle to a vessel under 14 feet depth of hold, the plans are to be submitted for the consideration of the Committee.

10. Where bridge-houses are fitted, the whole of the frames are to be extended to the height of the bridge-deck, or be connected to the stringer plates by knees and bracket plates, and the gunwale angle bar made continuous. Where efficient partial bulkheads are fitted, the alternate frames only need extend to the height of the bridge deck. When the frames are extended through the upper deck stringer plate there must be a continuous angle bar of the size given for lower deck stringer angles, wrought on the upper deck stringer plate, inside the frames.

11. Where the combined length of the poop, or raised quarter-deck, and bridge-house exceeds two-fifths the vessel's length, and the plating number is 15,000 and above, the sheerstrake should be doubled for one-half the vessel's length amidships, or other equivalent strength should be added to the satisfaction of the Committee.

12. This additional strengthening to be given also to vessels of over 11 depths in length and whose plating number is 15,000 and above, where a bridge-house is fitted of a length equal to or exceeding one-fifth the length of the vessel.

13. The doubling to the sheerstrake required by paragraph 11 may be dispensed with in vessels having bridge houses not less than two-fifths the length of the vessel, provided the bridge side plating be increased in thickness, and the upper strake treble riveted with buttstraps $\frac{1}{16}$ of an inch thicker than the plates, the bridge stringer plates be increased in breadth and thickness, a $\frac{5}{16}$ iron bridge deck be fitted the landing edges of bridge side plating be double riveted and the main sheerstrake be doubled at the ends of the bridge house with plates 18 to 20 feet long. The thickness of bridge side plating and

stringer plates to be as follows, and the bridge stringer angles of the size required for lower deck stringer angles:—

Plating numbers.	Bridge Sheerstrakes.	Bridge Side plating.	Bridge Stringer plates.
Under 15,000	36 × $\frac{8}{16}$	$\frac{8}{16}$	36 × $\frac{8}{16}$
15,000 to 19,000	36 × $\frac{9}{16}$	$\frac{8}{16}$	36 × $\frac{8}{16}$
19,000 to 23,000	36 × $\frac{10}{16}$	$\frac{9}{16}$	38 × $\frac{9}{16}$
23,000 to 27,000	36 × $\frac{10}{16}$	$\frac{9}{16}$	40 × $\frac{10}{16}$

RAISED QUARTER DECKS AND SUNK FORECASTLES. (See sketches at end of Rules.)

Section 45. 1. Side plating of raised quarter-decks and sunk forecastles may be $\frac{1}{16}$ of an inch less in thickness than topside plating below it if the topside plating be $\frac{7}{16}$ of an inch in thickness or more

2. The frames in all cases, and the reversed angles on alternate frames, are to extend to the raised quarter-deck and forecastle stringer plate.

3. The upper deck sheerstrake is to extend to the stern. The front or break bulkhead of the raised quarter-deck is to be stiffened by an athwartship plate, of not less size than the upper deck beam tie-plates, and efficiently connected to it by angle-bars; this athwartship plate is to receive the deck ends, and is to be supported by bracket plates when not riveted to a beam.

4. The number and arrangement of hold beams, beam stringers, and stringers in hold, in way of raised quarter decks must be in accordance with the Rules for the increased depth of the vessel, and the height of the reversed angles on the frames is to be regulated by the number for scantlings which the increased depth would give. The main sheerstake to be doubled for a reasonable distance before and abaft the break. Where, however, the raised quarter-deck is connected to a bridge house it is preferred that in lieu of this, the raised quarter-deck side plating should be doubled at the break for the same length. Should the raised quarter-deck side plating not be doubled it must be increased in thickness at the break, in addition to the sheerstrake being doubled. The bulwark plate of the raised quarter-deck adjoining the bridge side plating to be increased in thickness and the sheerstrake doubled at front of bridge. The butts of the side plating and stringers at these parts to be carefully arranged and the butts of the raised quarter-deck side plating, main sheerstrake, and the strake of plating next below are to be treble riveted in the neighbourhood of the break, and the butt-straps increased in thickness. The main deck stringer plate is to extend abaft the break about seven frame spaces, and the raised quarter-deck stringer plate about four frame spaces before the break and the stringer plates below the main deck are to have a shift of about sixteen feet overlap; the bridge stringer also is to extend abaft the break. *The size of beams of raised quarter-decks to be regulated as prescribed in Table* G 4.

5. In such vessels, of extreme proportions requiring by Table G 5 an Iron deck, or part Iron deck, where the raised quarter-deck is of considerable length, the main deck plating is to scarph the raised quarter-deck for a length of two to three frame spaces according to the size and proportions of the vessel. There are to be from four to five diaphragm plates of the thickness of the main deck plating, connecting the two decks, and attached to the bulkhead and decks by double angles and stiffened by an angle on the after edges. The raised quarter-deck side-plating is to be doubled at this part for a length of 18 to 20 feet.

6. Web plates not less than 15 inches deep to be fitted on the fore side of the bulkhead in way of the diaphragm plates, efficiently bracketed to the main and bridge deck plating.

7. Where the plating number is 24,000 and under 26,000, the main and raised quarter decks are to be scarphed four frame spaces, and where the plating number is 26,000 and above, five frame spaces. The webs on the fore side of the break bulkhead are to be not less than 18 inches deep. In such vessels the raised quarter deck side plating is to be doubled, commencing at one-fourth the length of the vessel from the stern and extending to 8 feet beyond the break of the raised quarter deck.

8. The break bulkhead to be of the thickness of the bridge side plating, and stiffened with angles of the size of the frames spaced 30 inches apart.

9. Where the plating number exceeds 20,000, or the vessel is over 13 depths to length, the break bulkhead is to be not less than four frame spaces abaft the after end of the engine-room opening.

10. Vessels which from their size and proportions do not require the decks to be scarphed, are to have from four to five bracket knees fitted on each side of the break bulkhead, the thickness of which is not to be less than that of the main deck plating.

11. The raised quarter-deck plating should be attached to the break bulkhead by double angles of not less size than that given in Table G 3 for middle deck stringer angles.

12. Where the combined length of the poop or raised quarter-deck and bridge-house exceeds two-fifths the vessel's length, and the plating number is 15,000 and above, the sheerstrake to be doubled for one-half the vessel's length amidships, or other equivalent strength added, to the satisfaction of the Committee.

VESSELS OF EXTREME PROPORTIONS.

Section 46. 1. Additional longitudinal strength, beyond that stated in the foregoing Rules, and Tables G 2, G 3, and G 5, will be required for vessels of extreme proportions, as shown in Table G 6.

2. *The length, breadth, and depth to be taken as per Section* 1.

3. For all vessels exceeding in length sixteen depths to the middle deck,* plans must be submitted for the approval of the Committee for giving the vessels sufficient additional strength longitudinally; and all vessels having a length of thirteen depths and above to the upper deck are to have a substantial erection extending over the midship half length of the vessel.

4. In all cases where keelsons, or other additions, are required for a certain portion of the length of a vessel, care should be taken to avoid any abrupt termination of this additional strength by tapering the keelsons, &c., beyond these limits, and properly shifting their terminations.

VESSELS NOT BUILT UNDER SURVEY.

Section 47. 1. In cases of vessels not surveyed while building, for which a character may be required, application must be made to the Committee in writing, who will direct a special examination to be made by two Surveyors of the Society (one of whom shall be an exclusive officer), for which purpose the vessel is to be placed on high blocks in a dry dock or on ways; the hold to be cleared and proper stages made; the rivets and plating of keel, and flat of bottom, thoroughly examined; the close ceiling

* All vessels, excepting those with an awning deck, whose plating number exceeds 35,000 and exceeding 16 depths in length taken from the main deck, are to have the whole of the reverse frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-decked vessels they are all to extend to the main deck.

in the hold to be removed where deemed necessary, and coal bunkers of steam vessels to be cleared; the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating exposed to view;* all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, stern-post, and rudder; and the plankshеers and waterways, if of wood, to be scraped bright. When the vessel is so prepared, the Surveyors are to ascertain by drilling the thickness of the plating in such parts as they may deem necessary, also the condition of all the parts of iron above named, and of the plankshеers, waterways, flat of decks, and their fastenings; and send a detailed report thereon, stating the dimensions and quality of the materials and workmanship, to the Committee, who will then assign the vessel such character as the facts may appear to them to warrant.

2. In addition to the above, the Special Surveys Nos. 1, 2, and 3 described on pages 7 to 11, and 70 to 74 of the Rules must be complied with, regulated by the age of the vessel, as in the case of vessels built under survey, and the periodical surveys are also to be held as in the case of vessels built under survey.

*In cases where the inner surface of the bottom plating is coated with cement or asphalte, if the coating be carefully inspected, and tested by beating or chipping and found sound and adhering satisfactorily to the iron, its removal may be dispensed with, provided that upon the removal of a portion of the plating, frames, and rivets under it, be found in satisfactory condition.

RULES FOR THE SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 48. 1. In steam vessels the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them in the manner shown in form No. 8 annexed. If found satisfactory, the Committee will thereupon grant a certificate, and insert in the Register Book the notification "LMC." *in red* (*i.e.* LLOYD'S MACHINERY CERTIFICATE) indicating that the machinery and boilers are certified to be in good order and safe working condition.

ORDINARY SURVEY OF NEW ENGINES OR BOILERS WILL BE AS FOLLOWS.

2. On the different parts of the engines during erection.

3. On the sea connections while being fitted to the vessel.

4. On the boiler plates when they are bent, flanged and holed, ready for riveting, and on stays, &c., while being fitted.

5. Testing the boilers by hydraulic pressure.

6. When engines and boilers are being fixed on board the vessel.

7. At the setting and testing of safety valves and trying the machinery under steam.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

8. In steam vessels built under special survey, the machinery and boilers must also be constructed under special survey.

9. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠ LMC," or "✠ NE&B," or "✠ NB."

10. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined, and from them the working pressure fixed.

11. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.

12. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

13. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 46.)

14. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

15. The boilers, together with the machinery, to be inspected at different stages of construction.

16. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

17. Two safety valves to be fitted to each boiler and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60lbs. per square inch, the safety-valves may be loaded to 5lbs. above the working pressure. If common valves are used, their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used they are to be tested under steam in the presence of the Surveyor; the accumulation in no case to exceed 10 per cent. of the working pressure.

18. An approved safety valve also to be fitted to the super-heater.

19. In winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

20. Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers and to be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

21. Stop valves to be fitted so that each boiler can be worked separately.

22. Each boiler to be fitted with a separate steam-gauge, to accurately indicate the pressure.

23. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside plating.

24. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

STEEL BOILERS.

25. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*See* Circular No. 438*, page 75):

1. The material of stays and of plates is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.

In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*

It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low-cherry red, and quenched in water of 82° Fahrenheit.

2. Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.

4. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

6. No steel stays are to be welded.

7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

26. The engines are to be fitted with two feed pumps each capable of supplying the boilers; the pumps, &c., to be so arranged that either can be overhauled whilst the other is at work.

27. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

28. In engines of 70 H.P. and under, one feed pump and one bilge pump will be deemed sufficient, provided they are of adequate capacity.

The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators for controlling their speed. If only one such pump is fitted for the main feed, the auxiliary feed pump required by paragraph 31 should also be fitted with an automatic speed regulator.

29. A bilge injection, or a bilge suction to the circulating pump, is to be fitted.

30. The engine bilge pumps are to be fitted capable of pumping from each compartment of the vessel. (*See* Section 38.) The mud boxes and roses in engine-room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

31. A steam pump is to be provided capable of supplying the boilers with water, this pump to be provided with suctions to the hotwell and also to the sea. A steam pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine room it

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for Iron Boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

must be fitted to be worked by hand. In small vessels in which only one steam pump is fitted, it must comply with all these requirements.

32. In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes, and all main steam pipes are to be tested by hydraulic pressure to twice the working pressure, in the presence of the Engineer Surveyor.

33. All discharge pipes to be, if possible, carried above the deep load-line, and to have discharge-valves fitted on the plating of the vessel in an accessible position.

34. No pipes to be carried through the bunkers without being properly protected.

35. Bilge suction pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

36. All shafts to be examined when rough turned and finished.

37. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, see the formulæ in paragraph 47.

STEEL CASTINGS.

38. **Steel Castings** may be used for engine purposes provided they fulfil the Committee's requirements, which are as follow :—

> For purposes for which **Cast Iron** is ordinarily employed, such as propeller bosses and blades, bed plates, engine framing and columns, brackets, weigh-shaft levers, pistons, cylinder covers, eccentric straps, bearing bushes, &c., the castings must be sound, and are to be subjected to such drop and hammering tests as are practicable.

For shafts or parts of shafts, and for purposes for which **forgings** are ordinarily employed the material must also be subjected to following tests :—

A tensile test is to be made from a piece taken from each casting. The tensile strength is not to exceed 30 tons per square inch, and the elongation is not to be less than 10 per cent. in a length of 8 inches, and a cold bending test turned to $1\frac{1}{4}$ inches diameter or planed to $1\frac{1}{4}$ inches square, is to be capable of being bent without fracture through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.

All steel castings are to be thoroughly annealed.

COCKS, PIPES, AND SEA CONNECTIONS.

39. With a view to ensuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and vessels having *new engines or boilers* :—

40. All sea-cocks to be fitted on the plating of the vessel above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

41. The bolts securing all cocks or sea connections to the plating of the vessel are to be tapped into the plating of the vessel or fitted with countersunk heads.

42. The blow-off cocks on the plating of the vessel are to be fitted with spigots passing through the

plating, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

43. Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

44. The arrangement of pumps, bilge injections, suction and delivery pipes, is to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

SPARE GEAR.

45. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

2 connecting rod or piston rod top-end bolts and nuts.
2 connecting rod bottom-end bolts and nuts.
2 main-bearing bolts.
1 set of coupling bolts.
1 set of feed and bilge pump valves.
1 set of piston springs (where common springs are used).
A quantity of assorted bolts and nuts.
Iron of various sizes.

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft.
Propeller shaft.
Propeller, or a full set of blades.
Stern-bush, or lignum-vitæ lining for bush.
1 pair of connecting rod brasses.
1 pair of cross-head brasses.
1 set of link brasses.
1 eccentric strap complete.
Air pump rod.
Circulating pump rod.
H.P. valve spindle.
L.P. valve spindle.
1 set of check valves.
6 cylinder cover bolts.
6 junk ring bolts.
4 valve chest cover bolts.
2 dozen boiler tubes.
3 dozen condenser tubes.
1 cylinder escape valve and spring.
1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS OF IRON BOILERS.

46. The strength of circular shells of iron boilers to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where C = co-efficient as per following table.
T = thickness of plate in inches.
D = mean diameter of shell in inches.
B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $\mathbf{B} = \frac{p-d}{p} \times 100$.

For rivets at joint $\mathbf{B} = \frac{n \times a}{p \times \mathbf{T}} \times 100$ with iron rivets in iron plates with punched holes.

$\mathbf{B} = \frac{n \times a}{p \times \mathbf{T}} \times 90$ with iron rivets in iron plates with drilled holes.

(In case of rivets being in double shear, $1{\cdot}75a$ is to be used instead of a.)

where p = pitch of rivets.
d = diameter of rivets.
a = sectional area of rivets.
n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula, the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$-inch thick and under.	For Plates $\frac{3}{4}$-thick and above $\frac{1}{2}$-inch	For Plates above $\frac{3}{4}$ inch thick.	
Lap Joint, Punched Holes	155	165	170	
Lap Joint, Drilled Holes	170	180	190	
Double Butt Strap Joint, Punched Holes	170	180	190	
Double Butt Strap Joint, Drilled Holes...	180	190	200	

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

CYLINDRICAL SHELLS OF STEEL BOILERS.

The strength of cylindrical shells of steel boilers is to be calculated from the following formula :—

$$\frac{\mathbf{C} \times (\mathbf{T} - 2) \times \mathbf{B}}{\mathbf{D}} = \text{working pressure in lbs. per square inch.}$$

where $\mathbf{D}$ = mean diameter of shell in inches.
$\mathbf{T}$ = thickness of plate in sixteenths of an inch.
$\mathbf{C} = 20$ when the longitudinal seams are fitted with double butt straps of equal width.
$\mathbf{C} = 19{\cdot}25$ when they are fitted with double butt straps of unequal width, only covering on one side the reduced section of plate at the outer lines of rivets.
$\mathbf{C} = 18{\cdot}5$ when the longitudinal seams are lap joints.
$\mathbf{B}$ = the least percentage of strength of longitudinal joint found as follows :—

For plate at joint $\mathbf{B} = \frac{p-d}{p} \times 100$.

For rivets at joint $B = \frac{n \times a}{p \times t} \times 85$ where steel rivets are used.

$$B = \frac{n \times a}{p \times t} \times 70$$ where iron rivets are used.

where p = pitch of rivets in inches.

t = thickness of plate in inches.

d = diameter of rivet holes in inches.

n = number of rivets used per pitch in the longitudinal joint.

a = sectional area of rivet in square inches.

In case of rivets in double shear $1{\cdot}75a$ is to be used instead of a.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted, to be stayed from the top of the dome or otherwise stiffened.

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the above tables.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the smallest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

Iron Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, and for all stays which are welded, 6,000 lbs. per square inch; for unwelded stays above $1\frac{1}{2}$ inches smallest diameter, 7,500 lbs. per square inch.

Steel Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 8,000 lbs. per square inch; for stays above $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch. No steel stays are to be welded.

Stay Tubes.—The stress is not to exceed 7,500 lbs. per square inch.

FLAT PLATES.

The strength of flat plates supported by stays to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

P = greatest pitch in inches,

C = 90 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with screw stays with riveted heads,

C = 100 for iron or steel plates above $\frac{7}{16}$ thick fitted with screw stays with riveted heads,

C = 110 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with stays and nuts,

C = 120 for iron plates above $\frac{7}{16}$ thick, and for steel plates above $\frac{7}{16}$ and under $\frac{9}{16}$ thick, fitted with screw stays and nuts,

$C = 135$ for steel plates $\frac{9}{16}$ thick and above, fitted with screw stays and nuts,

$C = 140$ for iron plates fitted with stays with double nuts,

$C = 150$ for iron plates fitted with stays with double nuts and washers outside the plates, of at least $\frac{1}{3}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

$C = 160$ for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, of at least $\frac{2}{5}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

$C = 175$ for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, when the washers are at least $\frac{2}{3}$ of the pitch in diameter and of the same thickness as the plates.

For iron plates fitted with stays with double nuts and doubling strips riveted to the outside of the plates, of the same thickness as the plates, and of a width equal to $\frac{2}{3}$ the distance between the rows of stays, C may be taken as 175, if P is taken to be the distance between the rows, and 190 when P is taken to be the pitch between the stays in the rows.

For steel plates, other than those for combustion chambers, the values of C may be increased as follows :—

$C = 140$ increased to 175,
150 „ 185,
160 „ 200,
175 „ 220,
190 „ 240.

If flat plates are strengthened with doubling plates securely riveted to them, having a thickness of not less than $\frac{2}{3}$ of that of the plates, the strength to be taken from

$$\frac{C \times (T + \frac{t}{2})^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where t = thickness of doubling plates in sixteenths, and C, T and P are as above.

Note.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

For steel tube plates in the nest of tubes the strength to be taken from

$$\frac{140 \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = the thickness of the plates in sixteenths of an inch,

P = the *mean* pitch of stay tubes from centre to centre.

For the wide water spaces between the nests of tubes the strength to be taken from

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where P = the horizontal distance from centre to centre of the bounding rows of tubes, and

$C = 120$ where the stay tubes are pitched with two plain tubes between them and are not fitted with nuts outside the plates,

C = 130 if they are fitted with nuts outside the plates,
C = 140 if each alternate tube is a stay tube not fitted with nuts,
C = 150 if they are fitted with nuts outside the plates,
C = 160 if every tube in these rows is a stay tube and not fitted with nuts,
C = 170 if every tube in these rows is a stay tube and each alternate stay tube is fitted with nuts outside the plates.

The thickness of tube plates of Combustion Chambers in cases where the pressure on the top of the chambers is borne by these plates is not to be less than that given by the following rule :—

$$T = \frac{P \times W \times D}{1600 \times (D - d)}$$

where P = working pressure in lbs. per square inch.
W = width of Combustion Chamber over plates in inches.
D = horizontal pitch of tubes in inches.
d = inside diameter of plain tubes in inches.
T = thickness of tube plates in sixteenths of an inch.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L - P) \times D \times L} = \text{working pressure in lbs. per square inch;}$$

where L = width between tube plates, or tube plate and back plate of chamber,
P = pitch of stays in girders,
D = distance from centre to centre of girders,
d = depth of girder at centre,
T = thickness of girder at centre. All these dimensions to be taken in inches.

Wrought Iron.

C = 6,000, if there is one stay to each girder.
C = 9,000, if there are two or three stays to each girder.
C = 10,000, if there are four or five stays to each girder.
C = 10,500, if there are six or seven stays to each girder.
C = 10,800, if there are eight stays or above to each girder.

Wrought Steel.

C = 6,600, if there is one stay to each girder.
C = 9,900, if there are two or three stays to each girder.
C = 11,000, if there are four or five stays to each girder.
C = 11,550, if there are six or seven stays to each girder.
C = 11,880, if there are eight stays or above to each girder.

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89{,}600 \times T^2}{L \times D} = \text{working pressure in lbs. per square inch;}$$

where T = thickness of plates in inches,

D = outside diameter of furnace in inches,

L = length of furnace in feet. If strengthening rings are fitted, the length between the rings is to be taken.

If the plates do not exceed $\frac{9}{16}$ in. in thickness, the pressure, however, is not to exceed

$$\frac{8{,}000 \times T}{D} = \text{lbs. per square inch.}$$

If the plates are of steel and exceed $\frac{9}{16}$ in. in thickness, the pressure is not to exceed

$$\frac{8{,}800 \times T}{D} = \text{lbs. per square inch.}$$

If the furnaces are fitted with a single Adamson ring at about the middle of their length, the pressure may be calculated from

$$\frac{10{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are fitted with two Adamson rings, then the pressure may be calculated from

$$\frac{11{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are fitted with a series of Adamson rings at intervals not exceeding 23 inches, the pressure may be calculated from

$$\frac{1{,}000 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch;}$$

where T = thickness in sixteenths of an inch,

D = outside diameter of furnaces.

The strength of corrugated furnaces made of steel, having a less tensile strength than 26 tons per square inch, the corrugations being 6 inches apart and $1\frac{1}{2}$ inches deep, to be calculated from

$$\frac{1{,}000 \times (T-2)}{D} = \text{working pressure in lbs. per square inch,}$$

The strength of furnaces made of steel, having a tensile strength between 26 and 30 tons per square inch, and corrugated on Fox's or Morison's plans, to be calculated from

$$\frac{1{,}259 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of ribbed furnaces (with ribs 9 inches apart) to be calculated from the following formula :—

$$\frac{1{,}160 \times (T-2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of spirally corrugated furnaces to be calculated from the following formula :—

$$\frac{912 \times (T-2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

and D = outside diameter of corrugated furnaces, or outside diameter of the plain parts of ribbed furnaces in inches.

The strength of Holmes' Patent Furnaces, in which the corrugations are not more than 16 inches apart from centre to centre, and not less than 2 inches high, to be calculated from the following formula :—

$$\text{Working pressure in lbs. per square inch} = \frac{945 \times (T-2)}{D}$$

where T = thickness of plain portions of furnace in sixteenths of an inch,

D = outside diameter of plain parts of the furnace in inches.

DONKEY BOILERS.

The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any cases where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULES FOR DETERMINING SIZES OF SHAFTS.

47. The diameters of crank and straight shafts are to be not less than those given by the following formula :—

For Compound Engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 04\ A + \cdot 006\ D + \cdot 02\ S) \times \sqrt[3]{P}$$

For Triple expansion engines with three cranks at equal angles—

$$\text{Diameter of crank shaft in inches} = (\cdot038\,A + \cdot009\,B + \cdot002\,D + \cdot0165\,S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot034\,A + \cdot011\,B + \cdot004\,C + \cdot0014\,D + \cdot016\,S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with three cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot028\,A + \cdot014\,B + \cdot006\,C + \cdot0017\,D + \cdot015\,S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with four cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot033\,A + \cdot01\,B + \cdot004\,C + \cdot0013\,D + \cdot0155\,S) \times \sqrt[3]{P}$$

where A = diameter of High Pressure Cylinder in inches,
B = diameter of first Intermediate Cylinder in inches,
C = diameter of second Intermediate Cylinder in inches,
D = diameter of Low Pressure Cylinder in inches,
S = Stroke of Pistons in inches,
P = Boiler pressure above atmosphere in lbs. per square inch.

The Screw shaft to be the same diameter as is required for the crank shaft.

Intermediate shafting should be at least $\frac{9}{10}$ths of the diameter required for the crank shaft.

NOTE.—The Rules are intended to apply to Two Cylinder Compound Engines, in which the ratio of areas of Low and High Pressure Cylinders does not exceed 4·5 to 1; to Triple Expansion Engines in which it does not exceed 9 to 1; to Quadruple Expansion Engines in which it does not exceed 12 to 1; and in all cases, as regards the stroke, in which the length of stroke is not less than one half the diameter or greater than the diameter of the Low Pressure Cylinder. Engines of extreme proportions beyond these limits being specially submitted to be dealt with on their merits.

PERIODICAL SURVEYS. (*See* N.B. at foot.)

48. The machinery and boilers of all steam ships are to be surveyed annually, if practicable, and in addition are to be submitted to a Special Survey upon the occasion of the Vessel's undergoing the Special Periodical Surveys Nos. 1, 2, and 3, prescribed in the Rules, unless the Machinery and Boilers have been specially surveyed within a period of twelve months.

49. At these Special Surveys, and on other occasions, if deemed necessary by the Surveyor, the propeller, stern-bush, and fastenings of the sea connections, are to be examined while the vessel is in dry dock, and, if deemed necessary by the Surveyors, the stern shaft is to be drawn and examined.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when Repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

50. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

51. The sea connections and arrangements of cocks, pipes, bilge suctions, roses, &c., are to be examined.

52. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure, the safe working pressure is to be determined by their actual condition.

53. The safety valves are to be examined and set to the safe working pressure.

54. If satisfactory, these surveys will be recorded in the Register Book thus: "L.M.C. 9,89" *in red;* or "B&MS. 9,89" *in red.*

55. "LMC." (LLOYD'S MACHINERY CERTIFICATE), with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

56. "B&MS." (BOILERS AND MACHINERY SURVEYED), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

57. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

58. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

59. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure ; the safe working pressure is to be determined by their actual condition.

60. The safety valves are to be examined and set to the safe working pressure.

61. If satisfactory, these surveys will be recorded in the Register Book thus : " B.S.9,89 " *in red.*

62. " B.S." (Boilers Surveyed) with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

63. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

64. In Steam Vessels the engines and boilers are to be considered as part of the equipment. (*See* Section 39, paragraphs 8 and 11.)

IRON SHIPS.

CLASSED UNDER REGULATIONS PREVIOUSLY PASSED FOR THE BUILDING AND CLASSIFICATION OF IRON SHIPS.

1. All vessels will be classed A so long as on careful annual and periodical *special* surveys they are found to be in a fit and efficient condition to carry dry and perishable cargoes. (*See* N.B. at foot.)

2. Differences of construction, as regard thickness of plating, strength, and probable durability, &c., will be indicated by the letters A, B, and C placed inside the letter A,—thus,   .

3. will denote that the vessels have been built in accordance with, or equal to, the Rules and Table G.

4. will denote vessels which are considered entitled to the A character, but which have not been built in accordance with the Rules.

5. All vessels to be subject to occasional or annual survey when practicable.

6. To entitle IRON VESSELS to retain the Characters assigned to them in the Register Book, they are required to be subjected to the following Special Surveys, designated No. 1, No. 2, and No. 3 respectively.

7. The periods at which these surveys are intended to be held, in the case of vessels classed or , are when a vessel is 4 years, 8 years, and 12 years old respectively, and at like periods from the date when the No. 3 Survey was held.*

8. In every case the date of build of a vessel is to be reckoned from the last date of the survey for first entry of classification, when such survey is completed within six months of the date of launching; but when the first entry survey is not completed within that period, then the date of build will be reckoned from six months after the date of launching. The date when the special periodical surveys respectively become due is to be calculated from the date of build, as above described, or the last date of the No. 3 Survey.

9. Similarly, vessels classed must be subjected to a special survey every *three* years, as per Nos. 1, 2, and 3, and afterwards as per Nos. 1, 2, and 3, consecutively.

10. In any case in which it may suit the convenience of the Owners, the special surveys, Nos. 1 and 2, may be held at any time within twelve months previous to the expiration of the period when they severally become due, and the special survey No. 3 may be held at any time before the date when it becomes due.

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the subsequent Special Surveys may be Nos. 1, 2, and 3, consecutively, dating from the completion of such No. 3 Survey.

N.B.—In order to prevent the disappointment arising from ships losing their characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

11. To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due.

12. When a special survey is only partially held, the Surveyors must give the Owners or their Agents written notice of the parts not surveyed, and also report the facts to the Committee.

13. If a vessel is at a port in the United Kingdom after the expiration of the prescribed period for survey, and is not subjected to the special survey then due, before leaving the United Kingdom, the word "*Expired*" will be inserted against her character in the Register Book ; and in no case will a vessel be allowed to retain her class if she has not been subjected to the whole of the requirements of the requisite special survey within twelve months from the date when the survey became due.

14. Vessels which have undergone either of the foregoing examinations will be noted in the Register Book, thus : *s.s.No.* 1—89, *s.s.No.* 2—89, *s.s.No.* 3—9,89, indicating the special survey and date thereof.

15. At each of these Special Surveys of Steam Vessels, the machinery and boilers—unless they have been specially surveyed within a period of twelve months—are to be examined as to their safety and efficiency by the Engineer-Surveyors, and reported upon to the Committee.

16. Whenever the engines or boilers are taken out, the bearers, with the floor-plates, keelsons, rivets, &c., under them are to be surveyed ; and whenever the bottom plating is to be cemented a survey is to be held prior to the cement being laid.

*Survey No. 1.

1. The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway, proper stages to be made and the holds and peaks to be cleared ; the limber boards and ceiling equal to not less than one strake fore and aft on each side removed,† and both surfaces of outside plating exposed,‡ and cleaned and coated where necessary.

2. The coal bunkers to be cleared for examination, and ceiling removed as in the holds.

3. In all vessels the masts, spars, and general equipment must be in good and efficient condition.

4. If the vessel has a double bottom, the ceiling must be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

5. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

6. Note.—*At the Special Survey No.* 1 *succeeding No.* 3, *the chain cables are to be ranged for inspection.* When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch according to their size, they are to be renewed.

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

‡ In cases where the inner surface of the bottom plating is coated with cement or asphalte, if the coating be carefully inspected and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

7. In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* also page 68.

8. The steam steering engine and its connections to be examined.

9. For periodical Surveys of Engines and Boilers, *see* page 8, paragraph 20, also pages 68 & 69.

*Survey No. 2.

1. The vessel is to be placed on blocks of sufficient height in a dry dock or on a slipway, proper stages to be made and the holds and peaks to be cleared; the limber boards and ceiling not less than *three* strakes fore and aft on each side removed, one of which is to be taken from the bilges. Where the ceiling in the flat of bottom is fitted in hatches the whole of the hatches and one strake of ceiling of the bilges are to be removed,† and both surfaces of outside plating exposed,‡ and cleaned and coated where necessary.

2. The coal bunkers to be cleared for examination, and ceiling removed as in the holds.

3. The windlass at this and all subsequent alternate special surveys to be unhung, where necessary, and its wood linings sufficiently stripped for examination. The chain cables are also to be ranged for inspection at this and all subsequent special surveys. When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch according to their size they are to be renewed.

4. In all vessels the masts, spars, and general equipment must be in good and efficient condition.

5. If the vessel has a double bottom, the ceiling must be removed therefrom, and the efficiency of the tanks be tested by a head of water to the height of the light water line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

6. After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No. 2, when that survey becomes due, ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the vessel.

7. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

8. The steam steering engine and its connections to be examined.

9. In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* page 8, paragraph 20, also page 68.

*Survey No. 3.

1. To be held by two Surveyors, one to be an Officer of the Society.—The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway, proper stages to be made, and the hold

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

‡ In cases where the inner surface of the bottom plating is coated with cement or asphalte, if the coating be carefully inspected and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

and peaks to be cleared; all the close ceiling to be removed, so that the rivets, plates of keel and flat of bottom may be thoroughly examined; coal bunkers of steam vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating, to be exposed, and where side lights are fitted, the condition of the plating in way of the same to be ascertained. All oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; the plank sheers and waterways, if of wood, to be scraped bright. When the vessel is thus prepared, the Surveyors are to ascertain the thickness of the plating by having holes drilled in such parts as may be deemed necessary,* and to furnish a detailed statement of the thicknesses in their report.

2. Such parts as may be found defective, or materially less than the required substance by Rule, are to be removed, and replaced with proper materials, equal in substance and quality to the original construction.† The plank sheers, waterways, flat of decks, and their fastenings, are also to be examined, and made good where necessary.

3. In all vessels the masts, spars, and general equipment must be in good and efficient condition. All mast and bowsprit wedging at this and subsequent Special Surveys to be removed, unless the plating of iron or steel masts and bowsprits is doubled in way of the same, when it will only be necessary to remove the wedging at the Special Surveys, No. 3. Iron or steel masts, bowsprits and yards, to be carefully tested by hammering, and if the plates are considered by the Surveyors to be materially wasted at any part, the thickness is to be ascertained by drilling.

NOTE.—*The masts and spars are to be subject to examination by the Surveyors when deemed necessary by them on other occasions besides Special Surveys.*

4. If the vessel has a double bottom, the ceiling must be removed therefrom, and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

5. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

6. The chain cables are to be ranged for inspection. When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch, according to their size, they are to be renewed.

7. The steam steering engine and its connections to be examined.

8. In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* page 8, paragraph 20, also page 68.

Second Special Survey, No. 3.

1. The vessel must be submitted to the same survey as before described for *Survey No* 3, with the following additions:—

2. The condition of the scantlings must be ascertained, the shell plating to be drilled at such parts

* In cases where the inner surface of the bottom plating is coated with cement or asphalte, if the coating be carefully inspected and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

† Where the deterioration in thickness is widespread, and it is not deemed advisable by the Owner to renew the material, on a detailed report being made by the resident Surveyor, the class of the vessel will be reconsidered.

as the Surveyors may consider necessary to satisfy themselves as to its thickness, the number of holes on each side in no case being less than the number of strakes of plating not covered with cement in the vessel.

3. Care should be taken especially to ascertain the extent of deterioration of steamers in way of the side bunkers and boilers.

4. A sketch showing the thickness at the parts where drilled is to accompany the report on the vessel, for the consideration of the Committee.

5. The plating in way of cement in the bottom need not be drilled, providing the cement be found to be adhering satisfactorily to the plating, and the Surveyors consider drilling unnecessary.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

IRON SHIPS.

With reference to notice No. 248, announcing the Committee's Resolutions of the 6th January, to allow in the case of Iron Ships (not being Spar-decked Ships) built in conformity with the Rules in other respects for the ⩓ Class, *a reduction of one-sixteenth of an inch* in the thickness of outside plating for all parts from that heretofore prescribed in Table G 2 attached to the Rules, and that Iron Ships which had been built upon the Rules hitherto in force, and classed ⩓, should be distinguished in the Register Book by an asterisk prefixed, thus *⩓.

NOTICE is hereby given, that in pursuance of a Resolution passed by the Committee this day, Ships only which may be built in conformity with the Rules for the ⩓ character in force prior to the 6th January, 1870, will be allowed that character, and will have an asterisk prefixed, thus *⩓. All other Iron Ships will be classed in accordance with the New Rules 100A, 90A, 80A or their intermediates.

The foregoing Resolution will apply to all Iron Ships built or contracted for after this date.

By order of the Committee,

GEORGE B. SEYFANG,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.
28th April, 1870.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE No. 438.*

BOILERS MADE OF STEEL.

NOTICE is hereby given, that the Committee of this Society have this day passed the following resolutions amending Notice No. 397 in regard to boilers made of steel :—

1. The use of steel will be sanctioned in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, provided the boilers be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled.

2. The material is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section,* with an ultimate elongation of not less than 20 per cent. in a length of eight inches. It is to be capable of being bent to a curve of which the inner radius is not greater than one and half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82° Fahrenheit.

Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented.† In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the furnaces and combustion chambers of the boilers.

4. The Society's Surveyor will attend at the steel works when necessary, and select the samples for testing before the plates are sheared to size, and these samples when marked by him for testing should, as far as practicable, be followed by the Surveyor through the different stages of preparation until the tests are completed.

5. The Society's Surveyor will require to have every facility placed in his way for tracing all plates to their respective charges and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the test applied to the material, is to be signed and forwarded to the boiler manufacturer, and the other is to be retained by himself.

6. The samples are taken for testing in order that the general quality of the material may be ascertained, and if any sample should fail to fulfil the conditions laid down, the plate from which the sample is taken must be rejected ; and further tests should be made before any material, made from the same cast or charge as the failing sample, can be approved.

7. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

8. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

9. No steel stays are to be welded.

10. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

By order of the Committee,

No. 2, White Lion Court, Cornhill, London, E.C.
19th May, 1881.

BERNARD WAYMOUTH,
Secretary.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

† When a great number of charges are represented in the number of plates submitted, a proportion of one tensile and one temper test to every ten plates will be deemed sufficient, providing they all prove to be satisfactory.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION, &c.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	...	...	...	£1	1 0
For each succeeding visit, when more than one visit is necessary	...	...	...	0	10 6

For special surveys special charges will be made, subject to the control of the Committee.

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an A1* or an A1* certificate; and once in every three years for vessels with an A1, A 1, A or an A certificate. When vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

First Survey.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally, and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water-line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

Second Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.

The windlass must be unhung when the main piece is of wood; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water-line.

Third Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

Fourth Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast-trim water line.

Fifth Survey.

The vessel must be submitted to the same survey as before described for "Second Survey."

Sixth Survey or Special Survey.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions :—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee, she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time ; and, before completing the report, the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an A1* or A1* certificate, ten years for vessels with an A1 or A1 certificate, and nine years for vessels with an A or A certificate; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an A1* or A1* certificate, twenty years for vessels with an A1 or A1 certificate, and eighteen years for vessels with an A or A certificate.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
2, WHITE LION COURT, CORNHILL, E.C.
1st September, 1885.

EXTRACTS FROM THE RULES of the late UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING).

EQUIPMENT FOR STEAM VESSELS.

Section 29.—The equipment of Anchors and Chain Cables and Hawsers to be in accordance with TABLE 14 for Steam Vessels (*see below*).

The tonnage regulating equipment is to be the gross register tonnage under upper deck, with the addition of three-tenths of the tonnage of erections above upper deck.

TABLE No. 14.—ANCHORS, CHAINS, AND HAWSERS FOR STEAM VESSELS.

VESSELS TONNAGE. *See Section 29.*	Anchors, with either Iron or Wood Stocks.								Stud-chain Cables.			Stream Chain.		Hawsers and Warps.				VESSELS TONNAGE. *See Section 29.*
	Number.			Weight.					Minimum Size.	Proved to Admiralty Test.	Length.			Tow Rope.	Hawsers.	Warps.	Length.	
				Bowers.		Stream.	Kedge.	2d Kedge.										
	Bowers.	Stream.	Kedges.	Without Stock.	Admiralty Test.													
Tons.				Cwt.	Tons.	Cwt.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Fath.	Size.	Inches.	Inches.	Inches.	Fath.	Tons.
100 and under 150	2	1	...	3	4·9	1	...	...	$1\frac{1}{16}$	8·1	120	45	$\frac{8}{16}$	$5\frac{1}{2}$	$3\frac{1}{2}$	...	90	100 and under 150
150 „ 188	2	1	1	4	6·4	$1\frac{3}{4}$	1	...	$1\frac{3}{16}$	11·9	150	45	$\frac{9}{16}$	6	4	...	90	150 „ 188
188 „ 225	2	1	1	$5\frac{1}{4}$	7·6	2	1	...	$1\frac{4}{16}$	13·8	165	45	$\frac{10}{16}$	6	4	...	90	188 „ 225
225 „ 263	2	1	1	6	8·2	$2\frac{1}{2}$	$1\frac{1}{4}$	...	$1\frac{5}{16}$	15·8	165	45	$\frac{10}{16}$	$6\frac{1}{2}$	4	...	90	225 „ 263
263 „ 300	2	1	1	$7\frac{1}{4}$	9·5	$2\frac{3}{4}$	$1\frac{1}{4}$	...	1	18	165	45	$\frac{11}{16}$	7	5	...	90	263 „ 300
300 „ 375	3	1	1	$8\frac{1}{4}$	10·4	3	$1\frac{1}{2}$	...	$1\frac{1}{16}$	20·3	165	60	$\frac{11}{16}$	$7\frac{1}{2}$	$5\frac{1}{2}$	...	90	300 „ 375
375 „ 450	3	1	2	10	12·0	$4\frac{3}{4}$	$2\frac{1}{4}$	1	$1\frac{2}{16}$	22·8	195	60	$\frac{12}{16}$	8	6	...	90	375 „ 450
450 „ 525	3	1	2	12	13·9	5	$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{16}$	25·4	195	60	$\frac{12}{16}$	$8\frac{1}{2}$	$6\frac{1}{2}$	...	90	450 „ 525
525 „ 600	3	1	2	$13\frac{1}{2}$	15·2	6	3	$1\frac{1}{2}$	$1\frac{4}{16}$	28·1	210	60	$\frac{13}{16}$	9	7	...	90	525 „ 600
600 „ 675	3	1	2	$15\frac{1}{4}$	16·7	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{16}$	31	210	60	$\frac{13}{16}$	$9\frac{1}{2}$	7	4	90	600 „ 675
675 „ 750	3	1	2	$16\frac{3}{4}$	18·0	7	$3\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{6}{16}$	34	240	60	$\frac{14}{16}$	10	8	5	90	675 „ 750
750 „ 900	3	1	2	18	19·0	8	4	2	$1\frac{7}{16}$	37·2	240	60	$\frac{14}{16}$	10	8	5	90	750 „ 900
900 „ 1050	3	1	2	21	21·6	9	$4\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{8}{16}$	40·5	240	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	900 „ 1050
1050 „ 1200	3	1	2	$23\frac{1}{2}$	23·5	10	5	$2\frac{1}{2}$	$1\frac{9}{16}$	44	270	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	1050 „ 1200
1200 „ 1350	3	1	2	$25\frac{1}{2}$	25·2	$10\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{10}{16}$	47·5	270	75	1	10	$9\frac{1}{2}$	6	90	1200 „ 1350
1350 „ 1500	3	1	2	$27\frac{3}{4}$	26·9	11	$5\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{11}{16}$	51·2	270	75	1	10	10	6	90	1350 „ 1500
1500 „ 1800	3	1	2	30	28·6	12	6	3	$1\frac{12}{16}$	55·1	270	75	$1\frac{1}{16}$	11	$10\frac{1}{2}$	$6\frac{1}{2}$	90	1500 „ 1800
1800 „ 2100	3	1	2	32	30·1	13	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{13}{16}$	59·1	270	75	$1\frac{1}{16}$	11	11	7	90	1800 „ 2100
2100 „ 2400	3	1	2	34	31·6	$13\frac{1}{2}$	$6\frac{3}{4}$	$3\frac{1}{4}$	$1\frac{14}{16}$	63·3	270	75	$1\frac{2}{16}$	11	11	7	90	2100 „ 2400
2400 „ 2700	3	1	2	$36\frac{1}{2}$	33·4	14	7	$3\frac{1}{2}$	$1\frac{15}{16}$	67·6	270	90	$1\frac{2}{16}$	12	12	8	90	2400 „ 2700
2700 „ 3000	3	1	2	38	34·5	$14\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	2	72	270	90	$1\frac{3}{16}$	12	12	8	90	2700 „ 3000
3000 „ 3450	3	1	2	40	35·7	15	$7\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{16}$	76·6	270	90	$1\frac{3}{16}$	12	12	8	90	3000 „ 3450
3450 „ 3900	3	1	2	41	37·0	16	8	$4\frac{1}{4}$	$2\frac{2}{16}$	81·3	300	90	$1\frac{3}{16}$	12	12	8	90	3450 „ 3900
3900 „ 4500	4	1	2	43	38·0	$17\frac{1}{2}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{16}$	86·1	300	90	$1\frac{4}{16}$	12	12	9	90	3900 „ 4500
4500 „ 5250	4	1	2	45	39·2	19	$9\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{4}{16}$	91·1	330	90	$1\frac{4}{16}$	12	12	9	90	4500 „ 5250
5250 „ 6000	4	1	2	47	41	21	10	5	$2\frac{5}{16}$	96	330	90	$1\frac{5}{16}$	12	12	9	90	5250 „ 6000

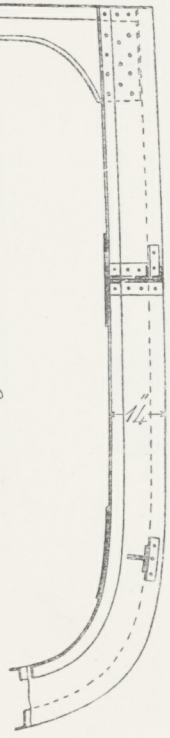
Anchors and Chains to be tested to Admiralty proof. A reduction of 15 per cent. will be allowed in the weight of the Third and Fourth Bower.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
2, WHITE LION COURT, CORNHILL, LONDON, E.C.—*15th April, 1893.*

Sketches illustrating the arrangement of Web-Frames and Side Stringers in lieu of Hold Beams, as per Section 14 a. paragraphs 9 to 19.

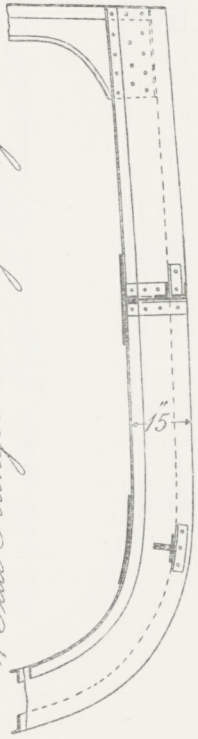
under 16 feet (par 9)

14" Web-frames, 8 frames spaces apart; 1 Side Stringer and bilge Stringer.



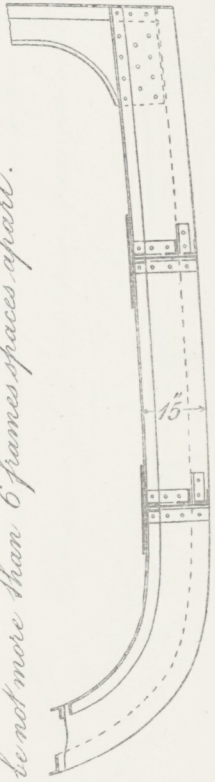
16 feet and under 17 feet (par 10)

15" Web-frames, 8 frames spaces apart; 1 Side Stringer and bilge Stringer.



17 feet and under 18 feet (par 11)

15" Web-frames, 8 frames spaces apart and 2 Side Stringers. When under 18 feet to the Middle or Lower deck the Web-frames to be not more than 6 frames spaces apart.

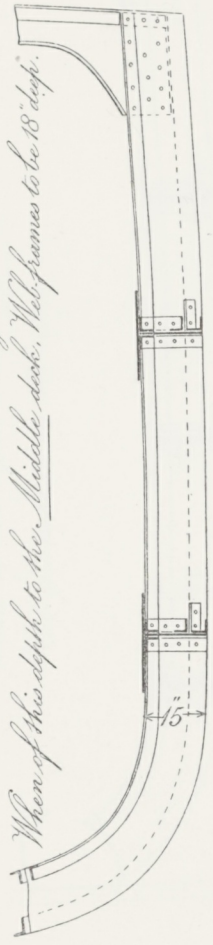


Web-frames and Side Stringers in lieu of Hold beams. (continued)

18 feet and under 21½ feet (par 12)

15" Web-frames, 6 frame spaces apart and 2 Side Stringers.

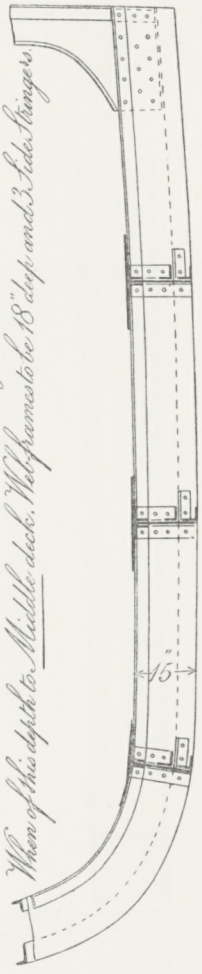
When of this depth to the Middle deck, Web-frames to be 18" deep.



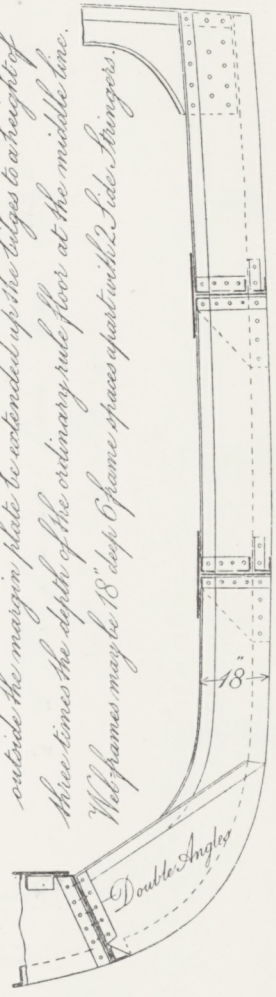
21½ feet and under 22½ feet (par 13)

15" Web-frames, 6 frame spaces apart and 3 Side Stringers.

When of this depth to Middle deck, Web-frames to be 18" deep and 3 Side Stringers.



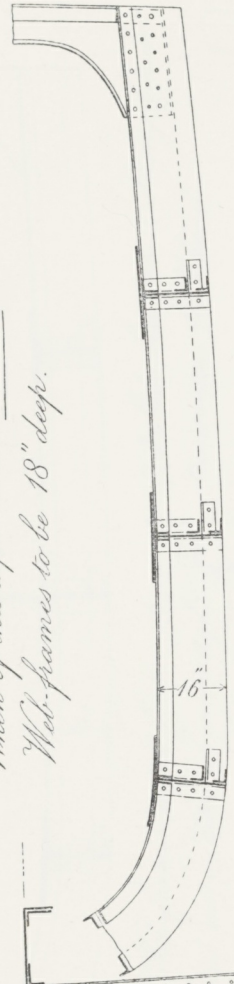
Or, In Vessels fitted with double bottoms, provided the brackets outside the margin plate be extended up the bilges to a height of three times the depth of the ordinary rule floor at the middle line. Web-frames may be 18" deep 6 frame spaces apart with 2 Side Stringers.



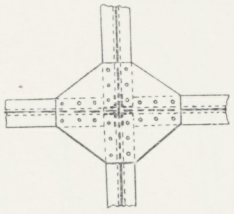
Web-frames and Side Stringers in lieu of Hold beams. (continued)

22½ feet and under 23½ feet (par 14)

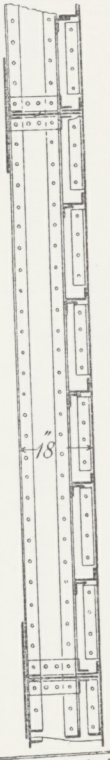
16" Web-frames, 6 frame spaces apart and 3 Side Stringers. When of this depth to the Middle deck Web-frames to be 18" deep.



Diamond Plates.

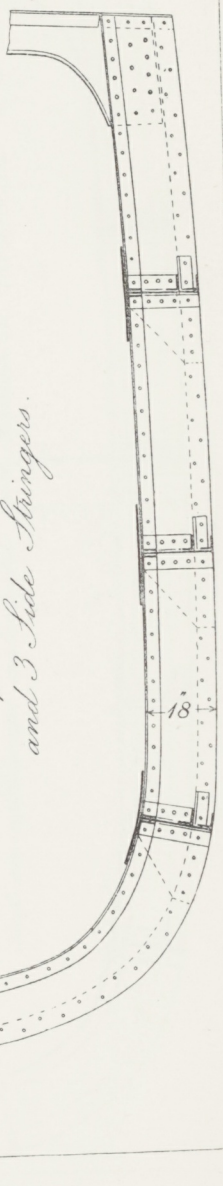


Side Stringer and Web-frames



23½ feet and under 24 feet (par 15)

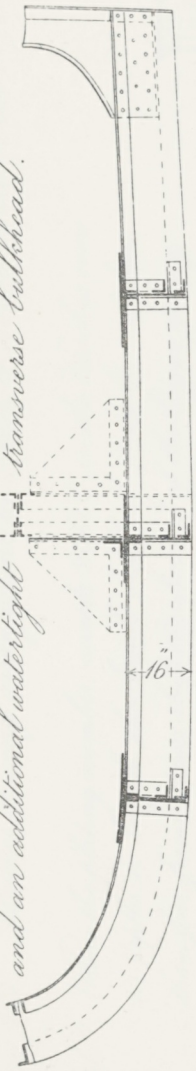
18" Web-frames, 6 frame spaces apart and 3 Side Stringers.



Web frames in way of Raised Quarter Deck in lieu of lower deck beams and beams of extra strength wide spaced in lower hold. (see section 14 a paragraphs 16 to 19)

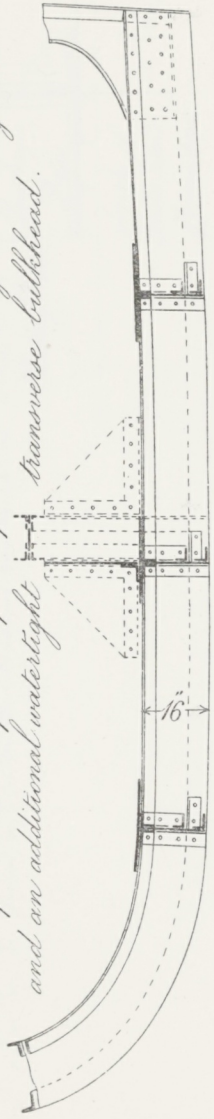
24 feet and under 25 feet (par 16)

16" Web frames, 5 frame spaces apart; 3 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.



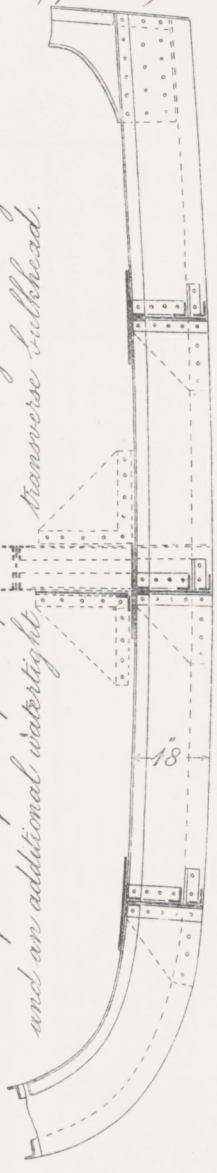
25 feet and under 26 feet (par 17)

16" Web frames, 4 to 5 frame spaces apart; 3 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.



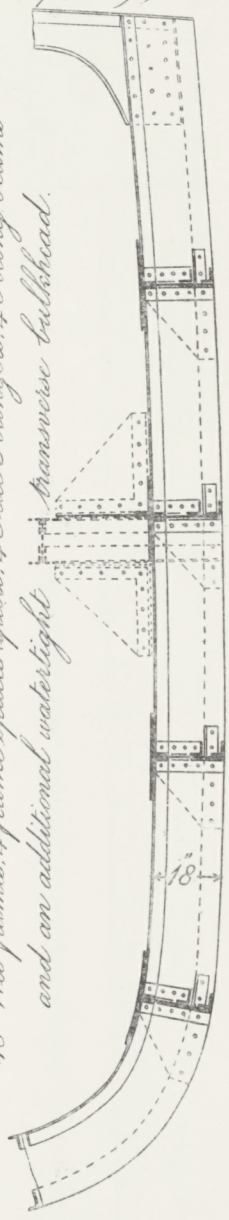
26 feet and under 27 feet (par 18)

18" Web frames, 4 frame spaces apart; 3 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.



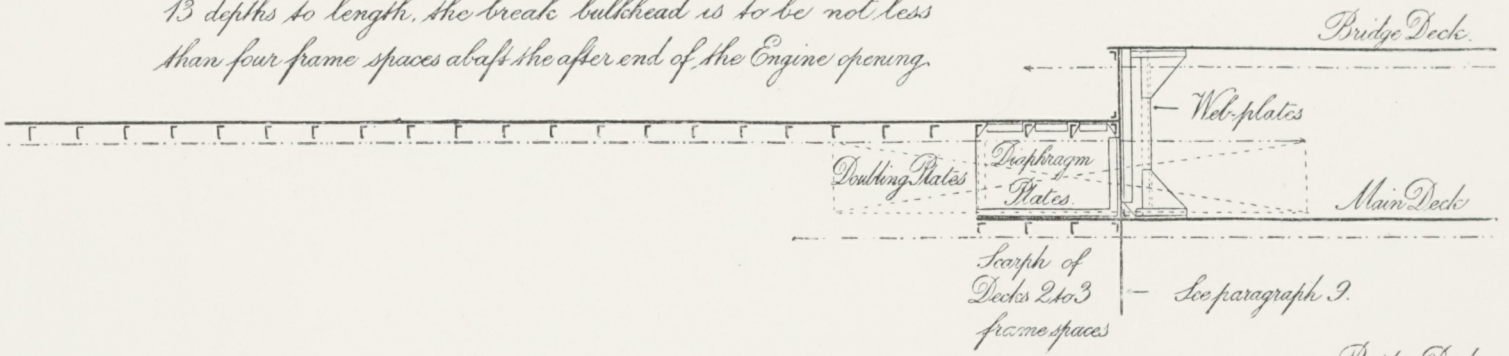
27 ft. and under 28 ft. (par 19)

18" Web frames, 4 frame spaces apart; 4 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.

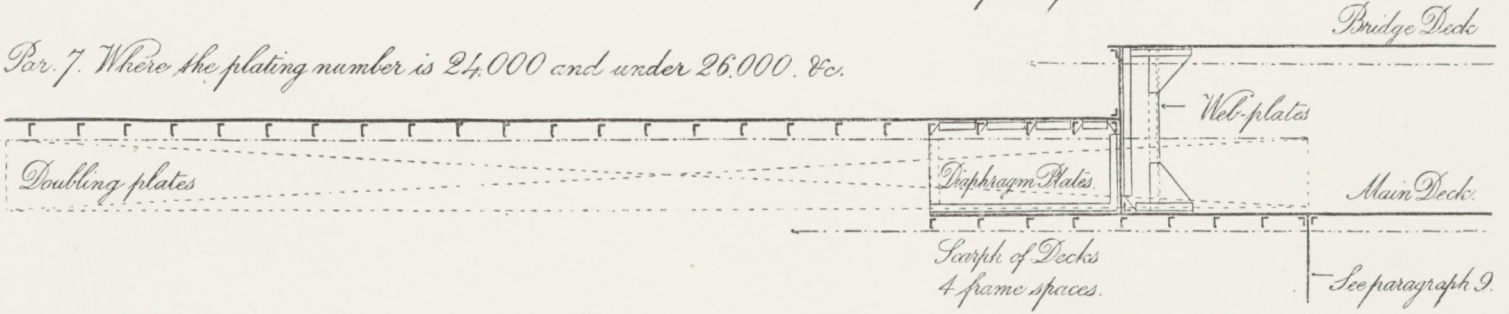


Section 45. Sketches shewing arrangements at Break, Raised Quarter Deck as per paragraphs 5.6.7.8 & 9.

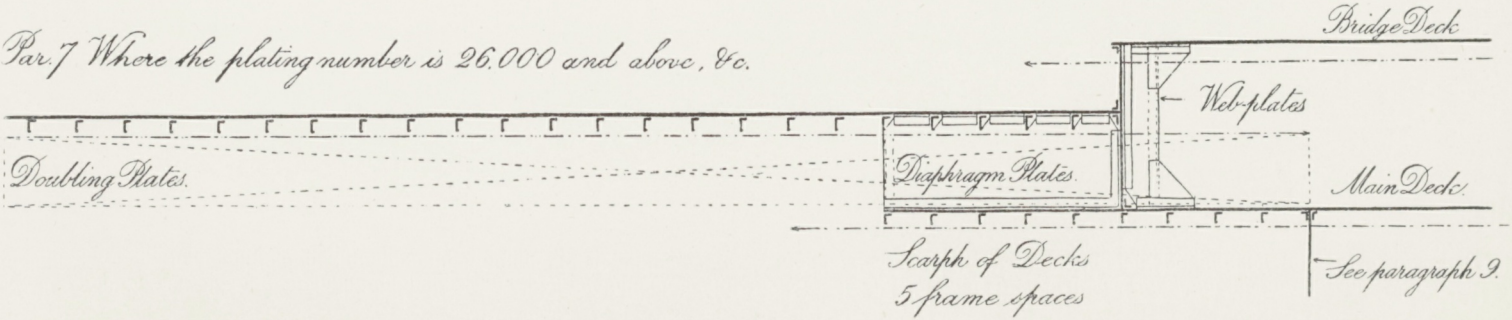
Paragraph 9. Where the plating number exceeds 20,000 or the Vessel is over 13 depths to length, the break bulkhead is to be not less than four frame spaces abaft the after end of the Engine opening.



Par. 7. Where the plating number is 24,000 and under 26,000. &c.



Par. 7 Where the plating number is 26,000 and above, &c.



IRON VESSELS.

Table of Minimum Dimensions of FRAMES

NUMBERS. For Frames, Reversed Frames, Bulkheads, and Pillars. *(See Section 2.)*	SPACING OF FRAMES.	FRAMES. Dimensions of angles for three-fifths the length of vessel amidships, and bulkheads.	FRAMES. Dimensions of angles before and abaft the three-fifths length.	Reversed Frames. Dimensions of Reversed angles all fore and aft.	Dimensions of ⌐ and Channel bar Frames for three-fifths length amidships.	Bulkheads. Lower Half.	Bulkheads. Upper Half.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
31·5 and under 37	20	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$	$2\frac{1}{4} \times 2\frac{1}{4} \times \frac{4}{16}$	...	$\frac{4}{16}$	$\frac{4}{16}$
37 and under 45	21	$3 \times 2\frac{1}{2} \times \frac{5}{16}$	$3 \times 2\frac{1}{2} \times \frac{5}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{4}{16}$	...	$\frac{4}{16}$	$\frac{4}{16}$
45 and under 52	21	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{5}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$	...	$\frac{4}{16}$	$\frac{4}{16}$
52 and under 57	22	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{5}{16}$	$3 \times 2\frac{1}{2} \times \frac{5}{16}$	$3\frac{1}{2} \times 3 \times 3 \times \frac{7}{16}$	$\frac{5}{16}$	$\frac{5}{16}$
57 and under 61	22	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3 \times 2\frac{1}{2} \times \frac{6}{16}$	$3\frac{1}{2} \times 3 \times 3 \times \frac{8}{16}$	$\frac{5}{16}$	$\frac{5}{16}$
61 and under 65	23	$4 \times 3 \times \frac{7}{16}$	$4 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$4 \times 3 \times 3 \times \frac{8}{16}$	$\frac{6}{16}$	$\frac{5}{16}$
65 and under 68	23	$4 \times 3 \times \frac{7}{16}$	$4 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$4 \times 3 \times 3 \times \frac{8}{16}$	$\frac{6}{16}$	$\frac{5}{16}$
68 and under 71	23	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	$4\frac{1}{2} \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{7}{16}$	$4\frac{1}{2} \times 3 \times 3 \times \frac{8}{16}$	$\frac{6}{16}$	$\frac{5}{16}$
71 and under 73	24	$4\frac{1}{2} \times 3 \times \frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	$3 \times 3 \times \frac{7}{16}$	$4\frac{1}{2} \times 3 \times 3 \times \frac{9}{16}$	$\frac{6}{16}$	$\frac{5}{16}$
73 and under 76	24	$5 \times 3 \times \frac{8}{16}$	$5 \times 3 \times \frac{7}{16}$	$3 \times 3 \times \frac{7}{16}$	$5 \times 3 \times 3 \times \frac{9}{16}$	$\frac{6}{16}$	$\frac{5}{16}$
76 and under 80	24	$5 \times 3 \times \frac{8}{16}$	$5 \times 3 \times \frac{7}{16}$	$3\frac{1}{2} \times 3 \times \frac{8}{16}$	$5 \times 3 \times 3 \times \frac{10}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
80 and under 85	24	$5 \times 3\frac{1}{2} \times \frac{8}{16}$	$5 \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$5 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
85 and under 92	24	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$5\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
92 and under 99	24	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$4 \times 3\frac{1}{2} \times \frac{8}{16}$	$5\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
99 and under 104	25	$6 \times 3\frac{1}{2} \times \frac{9}{16}$	$6 \times 3\frac{1}{2} \times \frac{8}{16}$	$4 \times 3\frac{1}{2} \times \frac{9}{16}$	$6 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
104 and under 110	25	$6 \times 3\frac{1}{2} \times \frac{10}{16}$	$6 \times 3\frac{1}{2} \times \frac{9}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$	$6 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
110 and under 115	26	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{16}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$	$6\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{16}$	$\frac{7}{16}$	$\frac{6}{16}$
115 and under 120	26	$7 \times 3\frac{1}{2} \times \frac{10}{16}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$	$4\frac{1}{2} \times 4 \times \frac{9}{16}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{16}$	$\frac{7}{16}$	$\frac{6}{16}$

MEMO.:—Wider spacing than the above may be adopted, provided th

The thickness given for Channel or ⌐ Sections is

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, London, E.C.,
15th December, 1892.

Diameter of Solid pillars, and diameter and thickness of hollow malleable pillars to beams.			
Solid Pillars.		Hollow malleable Pillars.	
Hold.	'Tween dk. poop, bridge, and forecastle.	Hold.	'Tween deck poop, bridge, and forecastle.
inches.	inches.	inches.	inches.
...	$2\frac{1}{4}$	...	$3 \times \frac{5}{16}$
...	$2\frac{1}{2}$	...	$3\frac{1}{4} \times \frac{5}{16}$
$2\frac{1}{2}$	$2\frac{3}{8}$	$3\frac{1}{4} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{5}{16}$
$2\frac{5}{8}$	$2\frac{3}{8}$	$3\frac{1}{2} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{5}{16}$
$2\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{3}{4} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$
$2\frac{7}{8}$	$2\frac{1}{2}$	$3\frac{7}{8} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$
3	$2\frac{1}{2}$	$4 \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$
$3\frac{1}{8}$	$2\frac{5}{8}$	$4 \times \frac{7}{16}$	$3\frac{1}{2} \times \frac{6}{16}$
$3\frac{1}{4}$	$2\frac{5}{8}$	$4\frac{1}{8} \times \frac{7}{16}$	$3\frac{1}{2} \times \frac{6}{16}$
$3\frac{3}{8}$	$2\frac{5}{8}$	$4\frac{1}{4} \times \frac{7}{16}$	$3\frac{1}{2} \times \frac{6}{16}$
$3\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{1}{2} \times \frac{7}{16}$	$3\frac{3}{4} \times \frac{6}{16}$
$3\frac{5}{8}$	$2\frac{3}{4}$	$4\frac{3}{4} \times \frac{7}{16}$	$3\frac{3}{4} \times \frac{6}{16}$
$3\frac{5}{8}$	$2\frac{3}{4}$	$4\frac{3}{4} \times \frac{7}{16}$	$3\frac{3}{4} \times \frac{6}{16}$
$3\frac{3}{4}$	$2\frac{7}{8}$	$5 \times \frac{7}{16}$	$3\frac{7}{8} \times \frac{6}{16}$
$3\frac{3}{4}$	$2\frac{7}{8}$	$5 \times \frac{7}{16}$	$3\frac{7}{8} \times \frac{6}{16}$
4	3	$5\frac{1}{2} \times \frac{7}{16}$	$4 \times \frac{6}{16}$
$4\frac{1}{4}$	3	$5\frac{3}{4} \times \frac{7}{16}$	$4 \times \frac{6}{16}$
$4\frac{1}{2}$	$3\frac{1}{4}$	$6 \times \frac{7}{16}$	$4\frac{1}{8} \times \frac{7}{16}$

TABLE FOR SIZES OF FLOORS.

Floor plates in engine and boiler space of steam vessels to be $\frac{1}{16}$ of an inch thicker than given in this table, where the plates are $\frac{9}{16}$ of an inch and under.

NUMBERS FOR FLOORS. *(See Section 2.)*	For three-fifths length amidships.	Thickness at Ends.	NUMBERS FOR FLOORS.—(continued.) *(See Section 2.)*	For three-fifths length amidships.	Thickness at Ends.
	inches.	inches.		inches.	inches.
31 and under 32	$9 \times \frac{4}{16}$	$\frac{4}{16}$	66 and under 67	$20 \times \frac{8}{16}$	$\frac{7}{16}$
32 and under 33	$9\frac{1}{2} \times \frac{4}{16}$	$\frac{4}{16}$	67 and under 68	$20\frac{1}{2} \times \frac{8}{16}$	$\frac{7}{16}$
33 and under 34	$10 \times \frac{4}{16}$	$\frac{4}{16}$	68 and under 69	$21 \times \frac{8}{16}$	$\frac{7}{16}$
34 and under 35	$10\frac{1}{2} \times \frac{4}{16}$	$\frac{4}{16}$	69 and under 70	$21 \times \frac{9}{16}$	$\frac{7}{16}$
35 and under 37	$11 \times \frac{5}{16}$	$\frac{5}{16}$	70 and under 71	$21\frac{1}{2} \times \frac{9}{16}$	$\frac{7}{16}$
37 and under 39	$11\frac{1}{2} \times \frac{5}{16}$	$\frac{5}{16}$	71 and under 72	$22 \times \frac{9}{16}$	$\frac{7}{16}$
39 and under 41	$12 \times \frac{5}{16}$	$\frac{5}{16}$	72 and under 73	$22\frac{1}{2} \times \frac{9}{16}$	$\frac{7}{16}$
41 and under 43	$12 \times \frac{6}{16}$	$\frac{5}{16}$	73 and under 74	$23 \times \frac{9}{16}$	$\frac{7}{16}$
43 and under 45	$12\frac{1}{2} \times \frac{6}{16}$	$\frac{5}{16}$	74 and under 76	$23\frac{1}{2} \times \frac{9}{16}$	$\frac{7}{16}$
45 and under 47	$13 \times \frac{6}{16}$	$\frac{5}{16}$	76 and under 78	$24 \times \frac{9}{16}$	$\frac{7}{16}$
47 and under 49	$13\frac{1}{2} \times \frac{6}{16}$	$\frac{5}{16}$	78 and under 80	$24 \times \frac{10}{16}$	$\frac{8}{16}$
49 and under 51	$14 \times \frac{6}{16}$	$\frac{5}{16}$	80 and under 84	$24\frac{1}{2} \times \frac{10}{16}$	$\frac{8}{16}$
51 and under 52	$14\frac{1}{2} \times \frac{6}{16}$	$\frac{5}{16}$	84 and under 88	$25 \times \frac{10}{16}$	$\frac{8}{16}$
52 and under 53	$15 \times \frac{6}{16}$	$\frac{5}{16}$	88 and under 90	$26 \times \frac{10}{16}$	$\frac{8}{16}$
53 and under 55	$15\frac{1}{2} \times \frac{6}{16}$	$\frac{5}{16}$	90 and under 92	$27 \times \frac{10}{16}$	$\frac{8}{16}$
55 and under 56	$15\frac{1}{2} \times \frac{7}{16}$	$\frac{6}{16}$	92 and under 95	$28 \times \frac{10}{16}$	$\frac{8}{16}$
56 and under 57	$16 \times \frac{7}{16}$	$\frac{6}{16}$	95 and under 98	$29 \times \frac{10}{16}$	$\frac{8}{16}$
57 and under 58	$16\frac{1}{2} \times \frac{7}{16}$	$\frac{6}{16}$	98 and under 101	$30 \times \frac{10}{16}$	$\frac{8}{16}$
58 and under 59	$17 \times \frac{7}{16}$	$\frac{6}{16}$	101 and under 105	$31 \times \frac{10}{16}$	$\frac{8}{16}$
59 and under 60	$17\frac{1}{2} \times \frac{7}{16}$	$\frac{6}{16}$	105 and under 108	$32 \times \frac{10}{16}$	$\frac{8}{16}$
60 and under 62	$17\frac{1}{2} \times \frac{8}{16}$	$\frac{7}{16}$	108 and under 110	$33 \times \frac{10}{16}$	$\frac{8}{16}$
62 and under 63	$18 \times \frac{8}{16}$	$\frac{7}{16}$	110 and under 113	$34 \times \frac{10}{16}$	$\frac{8}{16}$
63 and under 64	$18\frac{1}{2} \times \frac{8}{16}$	$\frac{7}{16}$	113 and under 116	$35 \times \frac{10}{16}$	$\frac{8}{16}$
64 and under 65	$19 \times \frac{8}{16}$	$\frac{7}{16}$	116 and under 120	$36 \times \frac{10}{16}$	$\frac{8}{16}$
65 and under 66	$19\frac{1}{2} \times \frac{8}{16}$	$\frac{7}{16}$			

framing and plating be increased in size to the satisfaction of the Committee.

be the minimum thickness of both webs and flanges.

IRON VESSELS.

Table of Minimum Dimensions of KEELS,

NUMBERS. For Keel, Stem, Sternpost, and Plating. *(See Section 2.)*	Bar Keels for all Grades.	Stem of Sailing vessels and Steamers, and Sternposts of Sailing vessels and Paddle Steamers.	Stern frames of Screw Steamers.	THICKNESS					
				Flat Plate Keels for all grades, breadth and thickness.		Garboard Strakes, breadth and thickness.			
				Three-fifths length amidships.	Ends.	100A		90A & 80A	
						Half length amidships.	Ends.	Half length amidships.	Ends.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
2600 and under 3400	6 × 1 1/8	5 1/2 × 1 1/8	5 1/2 × 2 1/4	30 × 8/16	6/16	30 × 6/16	6/16	30 × 6/16	6/16
3400 and under 5200	6 3/4 × 1 1/4	6 × 1 1/4	6 × 2 1/2	30 × 9/16	7/16	30 × 7/16	7/16	30 × 6/16	6/16
5200 and under 7200	7 × 1 5/8	6 1/4 × 1 5/8	6 1/4 × 3 1/4	30 × 10/16	8/16	30 × 8/16	8/16	30 × 7/16	7/16
7200 and under 8900	7 1/4 × 1 7/8	6 1/2 × 1 7/8	6 1/2 × 3 3/4	30 × 11/16	9/16	30 × 9/16	8/16	30 × 8/16	8/16
8900 and under 10450	7 1/2 × 2 1/8	6 3/4 × 2 1/8	6 3/4 × 4 1/4	32 × 12/16	9/16	32 × 9/16	8/16	32 × 8/16	8/16
10450 and under 11800	7 1/2 × 2 1/4	7 × 2 1/4	7 × 4 1/2	32 × 12/16	9/16	32 × 9/16	8/16	32 × 8/16	8/16
11800 and under 13100	8 × 2 3/8	7 × 2 3/8	7 × 4 3/4	32 × 13/16	10/16	32 × 10/16	9/16	32 × 9/16	8/16
13100 and under 14300	8 × 2 3/8	7 1/4 × 2 3/8	7 1/4 × 4 3/4	34 × 13/16	10/16	34 × 10/16	9/16	34 × 9/16	8/16
14300 and under 15500	8 × 2 3/8	7 1/2 × 2 3/8	7 1/2 × 4 3/4	34 × 14/16	11/16	34 × 11/16	10/16	34 × 10/16	9/16
15500 and under 16600	8 1/2 × 2 1/2	8 × 2 1/2	8 × 5	34 × 14/16	11/16	34 × 11/16	10/16	34 × 10/16	9/16
16600 and under 18700	9 × 2 1/2	8 1/2 × 2 1/2	8 1/2 × 5	36 × 15/16	11/16	36 × 11/16	10/16	36 × 10/16	9/16
18700 and under 21700	9 1/2 × 2 1/2	9 × 2 1/2	9 × 5 1/2	36 × 16/16	12/16	36 × 12/16	11/16	36 × 11/16	10/16
21700 and under 26400	10 × 2 3/4	10 × 2 3/4	10 × 6	36 × 16/16	12/16	36 × 12/16	11/16	36 × 11/16	10/16
26400 and under 30900	11 × 2 3/4	11 × 2 3/4	11 × 6 1/2	36 × 16/16	12/16	36 × 12/16	11/16	36 × 12/16	11/16
30900 and under 35200	11 × 3	11 × 3	11 × 7	36 × 17/16	13/16	36 × 13/16	12/16	36 × 12/16	11/16
35200 and under 40000	11 × 3 1/4	11 × 3 1/4	11 × 7 1/2	36 × 18/16	14/16	36 × 14/16	13/16	36 × 12/16	11/16
40000 and under 48500	12 × 3 1/4	12 × 3 1/4	12 × 8	36 × 19/16	14/16	36 × 14/16	13/16	—	—
48500 and under 56000	12 × 3 1/2	12 × 3 1/2	13 × 8 1/2	36 × 20/16	15/16	36 × 15/16	14/16	—	—
56000 and under 67000	12 × 3 3/4	12 × 3 3/4	13 × 9	36 × 20/16	15/16	36 × 15/16	14/16	—	—

MEM.—The Scantlings given in the above Table are intended for Vessels the length of which does not exceed *eleven times* their depth *from top of keel*, see Section 1. For Vessels which exceed this proportion, *See Section 46, and Table G 6.* For proportions of breadth to length, *see Table G 5.*

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, London, E.C., 29th November, 1888.

OF OUTSIDE PLATING.

From Garboard to the lower edge of Sheerstrake.*						Sheerstrakes for all grades, breadth, and thickness.		From main to upper Sheerstrake in Spar-decked vessels.		Spar deck Sheerstrake, breadth and thickness.		Awning deck and Bridge Side Plating, also Poops and Forecastles.
100A		90A		80A								
Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	
inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
$\frac{5}{16}$ & $\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{4}{16}$ & $\frac{5}{16}$	$\frac{4}{16}$ & $\frac{5}{16}$	30 × $\frac{6}{16}$	$\frac{5}{16}$	—	—	—	—	—
$\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$ & $\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	30 × $\frac{7}{16}$	$\frac{6}{16}$	—	—	—	—	—
$\frac{6}{16}$ & $\frac{7}{16}$	$\frac{5}{16}$ & $\frac{6}{16}$	$\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$ & $\frac{6}{16}$	$\frac{5}{16}$	30 × $\frac{8}{16}$	$\frac{7}{16}$	—	—	—	—	—
$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$ & $\frac{7}{16}$	$\frac{5}{16}$ & $\frac{6}{16}$	$\frac{6}{16}$	$\frac{5}{16}$	33 × $\frac{9}{16}$	$\frac{8}{16}$	—	—	—	—	—
$\frac{7}{16}$ & $\frac{8}{16}$	$\frac{6}{16}$ & $\frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$ & $\frac{7}{16}$	$\frac{5}{16}$ & $\frac{6}{16}$	33 × $\frac{10}{16}$	$\frac{8}{16}$	—	—	—	—	$\frac{5}{16}$
$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$ & $\frac{8}{16}$	$\frac{6}{16}$ & $\frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	33 × $\frac{10}{16}$	$\frac{8}{16}$	—	—	—	—	$\frac{5}{16}$
$\frac{8}{16}$ & $\frac{9}{16}$	$\frac{7}{16}$ & $\frac{8}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$ & $\frac{8}{16}$	$\frac{6}{16}$ & $\frac{7}{16}$	36 × $\frac{10}{16}$	$\frac{8}{16}$	—	—	—	—	$\frac{5}{16}$
$\frac{9}{16}$	$\frac{8}{16}$	$\frac{8}{16}$ & $\frac{9}{16}$	$\frac{7}{16}$ & $\frac{8}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	36 × $\frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	36 × $\frac{9}{16}$	$\frac{8}{16}$	$\frac{6}{16}$
$\frac{9}{16}$ & $\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{8}{16}$ & $\frac{9}{16}$	$\frac{7}{16}$ & $\frac{8}{16}$	36 × $\frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	36 × $\frac{9}{16}$	$\frac{8}{16}$	$\frac{6}{16}$
$\frac{9}{16}$ & $\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{8}{16}$ & $\frac{9}{16}$	$\frac{8}{16}$	36 × $\frac{12}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	36 × $\frac{10}{16}$	$\frac{8}{16}$	$\frac{6}{16}$
$\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$ & $\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	40 × $\frac{12}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	40 × $\frac{10}{16}$	$\frac{8}{16}$	$\frac{6}{16}$
$\frac{10}{16}$ & $\frac{11}{16}$	$\frac{8}{16}$ & $\frac{9}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$ & $\frac{10}{16}$	$\frac{8}{16}$	40 × $\frac{13}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	40 × $\frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{11}{16}$	$\frac{9}{16}$	—	—	—	—	40 × $\frac{13}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	40 × $\frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{11}{16}$ & $\frac{12}{16}$	$\frac{9}{16}$	—	—	—	—	40 × $\frac{13}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	40 × $\frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{12}{16}$	$\frac{9}{16}$	—	—	—	—	44 × $\frac{13}{16}$	$\frac{10}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	44 × $\frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{12}{16}$ & $\frac{13}{16}$	$\frac{9}{16}$ & $\frac{10}{16}$	—	—	—	—	44 × $\frac{14}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	44 × $\frac{12}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{13}{16}$	$\frac{10}{16}$	—	—	—	—	44 × $\frac{14}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	44 × $\frac{12}{16}$	$\frac{9}{16}$	$\frac{7}{16}$
$\frac{13}{16}$ & $\frac{14}{16}$	$\frac{10}{16}$ & $\frac{11}{16}$	—	—	—	—	46 × $\frac{15}{16}$	$\frac{12}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	46 × $\frac{13}{16}$	$\frac{10}{16}$	$\frac{7}{16}$
$\frac{14}{16}$	$\frac{11}{16}$	—	—	—	—	46 × $\frac{16}{16}$	$\frac{13}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	46 × $\frac{14}{16}$	$\frac{11}{16}$	$\frac{7}{16}$

* In the columns for plating, where two thicknesses are given they are to be worked in alternate strakes, and the larger thickness is to apply to the outer strakes, and the smaller one to the inner strakes; and the size of the rivets and double riveting to be regulated by the thickness of the thicker plating.

IRON VESSELS

IRON VESSELS.

Table of Minimum Dimensions of KEELSONS, KEELSON AND

NUMBERS. To regulate keelsons stringers, decks, rudders, ceiling, and windlasses. *(See Section 2.)*	Size of middle-line keelsons standing upon floors, and thickness of rider plate to keelson, for all grades.		Thickness of Intercostal keelson plates.	Dimensions of angle bars for keelsons, and stringers in hold, for all grades.	Dimensions of angle bar on the middle, lower or hold, and orlop beam stringer plates on upper deck stringer plates in spar-decked, and awning-decked vessels.	Dimensions of angle bars on upper deck stringer plates.	RUDDER. Sailing Vessels.	
	Half length amidships.	Thickness at ends.					Diam. at the head.	Diam. at the heel & pintle.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
2600 and under 3400	$7\frac{1}{2} \times \frac{6}{16}$	$\frac{5}{16}$	$\frac{4}{16}$	$3 \times 3 \times \frac{6}{16}$	$2\frac{3}{4} \times 2\frac{3}{4} \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$2\frac{7}{8}$	2
3400 and under 5200	$8\frac{1}{2} \times \frac{7}{16}$	$\frac{6}{16}$	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	3	2
5200 and under 7200	$10 \times \frac{8}{16}$	$\frac{7}{16}$	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3\frac{1}{2}$	2
7200 and under 8900	$11 \times \frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{7}{16}$	$3\frac{3}{4}$	$2\frac{1}{4}$
8900 and under 10450	$12 \times \frac{9}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$4 \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4\frac{1}{4}$	$2\frac{1}{2}$
10450 and under 11800	$12 \times \frac{10}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4\frac{1}{2}$	$2\frac{3}{4}$
11800 and under 13100	$13 \times \frac{10}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4 \times 4 \times \frac{7}{16}$	$4\frac{3}{4}$	$2\frac{3}{4}$
13100 and under 14300	$14 \times \frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$5 \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$4 \times 4 \times \frac{8}{16}$	5	3
14300 and under 15500	$15 \times \frac{11}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$5 \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$4 \times 4 \times \frac{8}{16}$	$5\frac{1}{4}$	3
15500 and under 16600	$16 \times \frac{12}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{8}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{16}$	$5\frac{1}{2}$	3
16600 and under 18700	$17 \times \frac{12}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$5 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{16}$	6	3
18700 and under 21700	$18 \times \frac{13}{16}$	$\frac{11}{16}$	$\frac{8}{16}$	$5\frac{1}{2} \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{16}$	$6\frac{1}{4}$	$3\frac{1}{4}$
21700 and under 26400	$19 \times \frac{13}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$6 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$6\frac{3}{4}$	$3\frac{1}{2}$
26400 and under 30900	$21 \times \frac{14}{16}$	$\frac{12}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$7\frac{1}{2}$	$3\frac{3}{4}$
30900 and under 35200	$23 \times \frac{14}{16}$	$\frac{12}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{16}$	8	4
35200 and under 40000	$26 \times \frac{14}{16}$	$\frac{12}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{16}$	$8\frac{1}{2}$	$4\frac{1}{2}$
40000 and under 48500	$28 \times \frac{14}{16}$	$\frac{12}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{16}$	—	—
48500 and under 56000	$30 \times \frac{15}{16}$	$\frac{13}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$5 \times 5 \times \frac{11}{16}$	—	—
56000 and under 67000	$32 \times \frac{15}{16}$	$\frac{13}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$5 \times 5 \times \frac{11}{16}$	—	—

RUDDER.*		Thickness of upper deck. (*a*)		Thickness of wood ceiling in hold, to upper part of bilges.	WINDLASS.				NUMBERS. To regulate keelsons stringers, decks, rudders, ceiling, and windlasses.
Steam Vessels.					Sailing Vessels.		Steam Vessels.		
Diam. at the head.	Diam. at the heel & pintle.	Wood.	Iron.		Diam. of iron Spindle.	Diam. of main piece.	Diam. of iron Spindle.	Diam. of main piece.	
inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	
3	2	$2\frac{1}{2}$	—	2	$2\frac{1}{4}$	$12\frac{1}{2}$	2	12	2600 and under 3400
$3\frac{1}{2}$	2	3	—	2	$2\frac{1}{2}$	14	$2\frac{1}{4}$	13	3400 and under 5200
$3\frac{3}{4}$	$2\frac{1}{4}$	3	$\frac{5}{16}$	2	$2\frac{3}{4}$	15	$2\frac{1}{2}$	14	5200 and under 7200
$4\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$\frac{5}{16}$	$2\frac{1}{2}$	3	16	$2\frac{3}{4}$	15	7200 and under 8900
$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{5}{16}$	$2\frac{1}{2}$	$3\frac{1}{4}$	17	$2\frac{3}{4}$	15	8900 and under 10450
$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{5}{16}$	$2\frac{1}{2}$	$3\frac{1}{2}$	18	3	16	10450 and under 11800
5	3	$3\frac{1}{2}$	$\frac{5}{16}$	$2\frac{1}{2}$	$3\frac{5}{8}$	19	$3\frac{1}{4}$	17	11800 and under 13100
$5\frac{1}{4}$	3	$3\frac{1}{2}$	$\frac{6}{16}$	$2\frac{1}{2}$	$3\frac{3}{4}$	20	$3\frac{1}{4}$	17	13100 and under 14300
$5\frac{1}{2}$	3	$3\frac{1}{2}$	$\frac{6}{16}$	$2\frac{1}{2}$	4	21	$3\frac{1}{2}$	18	14300 and under 15500
$5\frac{3}{4}$	3	4	$\frac{6}{16}$	$2\frac{1}{2}$	$4\frac{1}{4}$	22	$3\frac{5}{8}$	19	15500 and under 16600
$6\frac{1}{4}$	$3\frac{1}{4}$	4	$\frac{6}{16}$	$2\frac{1}{2}$	$4\frac{1}{2}$	23	$3\frac{5}{8}$	19	16600 and under 18700
7	[illegible]	[illegible]	$\frac{6}{16}$	$2\frac{1}{2}$	$4\frac{5}{8}$	24	4	21	18700 and under 21700
$7\frac{3}{4}$	$3\frac{3}{4}$	4	$\frac{6}{16}$	$2\frac{1}{2}$	$4\frac{5}{8}$	$25\frac{1}{2}$	$4\frac{1}{2}$	23	21700 and under 26400
$8\frac{1}{2}$	4	4	$\frac{7}{16}$	$2\frac{1}{2}$	$4\frac{3}{4}$	27	$4\frac{5}{8}$	24	26400 and under 30900
9	$4\frac{1}{2}$	4	—	$2\frac{1}{2}$	$4\frac{3}{4}$	$28\frac{1}{2}$	$4\frac{5}{8}$	$25\frac{1}{2}$	30900 and under 35200
$9\frac{1}{2}$	$4\frac{3}{4}$	4	—	$2\frac{1}{2}$	5	30	$4\frac{3}{4}$	27	35200 and under 40000
10	5	4	—	$2\frac{1}{2}$	—	—	—	—	40000 and under 48500
$10\frac{1}{2}$	$5\frac{1}{4}$	4	—	$2\frac{1}{2}$	—	—	—	—	48500 and under 56000
11	$5\frac{1}{2}$	4	—	$2\frac{1}{2}$	—	—	—	—	56000 and under 67000

* *See also* Sections 36 and 42.

(*a*) When the deck is of Teak, it may be one-sixth less in thickness. Where an iron deck is substituted for a wood one, it is not to be less than as given above, and supported by beams as in the case of iron decks required by Table G 5. When the deck is of iron as required by the Rules, it is to be in thickness as given in Table G 5.

Diameter of Nut and Screw Bolts for Fastening Flat of Deck.	
3 ins. and under $3\frac{1}{2}$ ins.	$\frac{1}{2}$ inch.
$3\frac{1}{2}$,, ,, 4 ,, ...	$\frac{9}{16}$,,
4 inches	$\frac{5}{8}$,,

Mem.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed *eleven times* their depth *from top of keel, see Section 1. For Vessels which exceed this proportion, see Section 46, and Table G 6. For proportions of breadth to length, see Table G 5.*

Lloyd's Register of Shipping,
2, White Lion Court, Cornhill, London, E.C.
29th November, 1888.

TABLE G 3.

IRON VESSELS

IRON VESSELS.

Length of Beam amidships.	Upper and Lower Deck Beams in one and two-decked Vessels, Main and Lower Deck Beams in "Three deck" and spar-decked Vessels, and Beams of raised quarter decks.				Upper Deck Beams in "Three-deck" Vessels. (*a*)				Size of Spar deck Beams (*a*) all fore and aft, and Forecastle Beams.	
	Size of Beams amidships.		Size of Beams less than three-fourths the length of the midship Beam.		Size of Beams amidships.		Size of Beams less than three-fourths the length of the midship Beam.			
Feet.	Bulb Plate. ins. ins.	Single Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	
16		$4\frac{1}{2} \times 3 \times \frac{6}{16}$								
18		$5 \times 3 \times \frac{7}{16}$								
20	$5 \times \frac{5}{16}$ Sng. Ang. Bar	Double Angle Bars $2 \times 2 \times \frac{5}{16}$ $5\frac{1}{2} \times 3 \times \frac{7}{16}$								
22	$5\frac{1}{2} \times \frac{5}{16}$	$2\frac{1}{2} \times 2\frac{1}{4} \times \frac{5}{16}$								
24	$6 \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$	$5\frac{1}{2} \times \frac{5}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$						
26	$6\frac{1}{2} \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$6 \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$6 \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$			$5\frac{1}{2} \times \frac{5}{16}$	
28	$7 \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$6 \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$6 \times \frac{6}{16}$	
30	$7\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$	
32	$8 \times \frac{8}{16}$	$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$	
34	$8\frac{1}{2} \times \frac{8}{16}$	$3 \times 3 \times \frac{7}{16}$	$7\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{7}{16}$	$7\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	
36	$9 \times \frac{9}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8 \times \frac{8}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8 \times \frac{8}{16}$	$3 \times 3 \times \frac{6}{16}$	$7\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$7\frac{1}{2} \times \frac{7}{16}$	
38	$9\frac{1}{2} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$8\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$8\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8 \times \frac{8}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8 \times \frac{8}{16}$	
40	$10 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9 \times \frac{9}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8\frac{1}{2} \times \frac{8}{16}$	
42	$10\frac{1}{2} \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$9 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9 \times \frac{8}{16}$	
44	$11 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	
46	$11\frac{1}{2} \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	
48	$12 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10\frac{1}{2} \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10\frac{1}{2} \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10 \times \frac{9}{16}$	
50	$12 \times \frac{11}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$	$11 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$11 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10\frac{1}{2} \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10\frac{1}{2} \times \frac{9}{16}$	

The size of all beams (with the exception of those of spar decks, awning decks, poops and forecastles), which are not less in length than three-fourths of the length of the midship beam, to be of the size given above for beams amidships; those of less length may be of the size given above, excepting those at hatchways exceeding in length four spaces of frames, mast and windlass beams, and beams under deck houses and the heel of bowsprit, which must not be less in size than the midship beam.

Strong beams in the machinery space must in all cases have double angle bars on their upper and lower edges.

No reduction is admitted at the ends of vessels in the size of spar and awning deck beams, and beams of poops and forecastles from those given above.

Where a poop, bridge, or forecastle is fitted on a spar deck, the beams may be one grade smaller than given above for poop, bridge, and forecastle beams.

The beams to fore and after peak tanks to be fitted to every frame, and to be of the size required for main deck beams at the ends of the vessel.

Butterley beams, when substituted for bulb plate and double angles, may, except in the case of wide spaced strong hold beams be of the depth and thickness given for bulb beams in Table.

LLOYD'S REGISTER OF SHIPPING, 2, WHITE LION COURT, CORNHILL, LONDON, E.C.

28th April, 1892.

BEAMS.

TABLE G 4.

Size of Spar-deck Beams (*a*) all fore and aft, and Forecastle Beams.	Size of Awning Deck Beams, Poop Beams, and Bridge Beams (*a*).		Hold Beams (*b*) of Extra Strength.		Beams on every frame where Iron Decks are fitted (*c*).		
					One, two & "Three deck" Vessels.	Spar deck.	Awning deck, Poop, Bridge, and Forecastle (*d*).
Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Single Angle Bars. ins. ins. ins.	Plt. or Bulb Plt. ins. ins.	Size of Angle Bars. ins. ins. ins.	Single Angle Bars. ins. ins. ins.	Single Angle Bars. ins. ins. ins.	Single Angle Bars. ins. ins. ins.
$4\frac{1}{2} \times 3 \times \frac{7}{16}$ Single Angle.							
$5 \times 3 \times \frac{7}{16}$ Single Angle.		$4\frac{1}{2} \times 3 \times \frac{6}{16}$			$4 \times 2\frac{1}{2} \times \frac{6}{16}$		
$5\frac{1}{2} \times 3 \times \frac{7}{16}$ Single Angle.		$5 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$5 \times 3 \times \frac{6}{16}$	$4 \times 2\frac{1}{2} \times \frac{6}{16}$	
$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$		$5 \times 3 \times \frac{7}{16}$	$7\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{7}{16}$	$5 \times 3 \times \frac{7}{16}$	$5 \times 3 \times \frac{6}{16}$	
$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$		$5\frac{1}{2} \times 3 \times \frac{7}{16}$	$8 \times \frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$	$5\frac{1}{2} \times 3 \times \frac{7}{16}$	$5 \times 3 \times \frac{7}{16}$	$4 \times 2\frac{1}{2} \times \frac{6}{16}$
$3 \times 2\frac{1}{2} \times \frac{5}{16}$		$6 \times 3 \times \frac{7}{16}$	$8\frac{1}{2} \times \frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$	$5\frac{1}{2} \times 3 \times \frac{8}{16}$	$5\frac{1}{2} \times 3 \times \frac{7}{16}$	$4\frac{1}{2} \times 3 \times \frac{6}{16}$
$3 \times 3 \times \frac{5}{16}$		$6\frac{1}{2} \times 3 \times \frac{8}{16}$	$9 \times \frac{9}{16}$	$4 \times 3\frac{1}{2} \times \frac{8}{16}$	$5\frac{1}{2} \times 3 \times \frac{8}{16}$ Bulb Angle.	$5\frac{1}{2} \times 3 \times \frac{8}{16}$	$5 \times 3 \times \frac{6}{16}$
$3 \times 3 \times \frac{6}{16}$	$6 \times \frac{6}{16}$ Bulb Angle.	Double Angle Bars. $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$ $6\frac{1}{2} \times 3 \times \frac{8}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{8}{16}$	$6 \times 3 \times \frac{8}{16}$ Bulb Angle.	$5\frac{1}{2} \times 3 \times \frac{8}{16}$ Bulb Angle.	$5 \times 3 \times \frac{7}{16}$
$3 \times 3 \times \frac{6}{16}$	$6\frac{1}{2} \times \frac{6}{16}$ Bulb Angle.	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$ $7 \times 3 \times \frac{8}{16}$	$10 \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$6\frac{1}{2} \times 3 \times \frac{9}{16}$ Bulb Angle.	$6 \times 3 \times \frac{8}{16}$ Bulb Angle.	$5\frac{1}{2} \times 3 \times \frac{7}{16}$
$3 \times 3 \times \frac{6}{16}$	$7 \times \frac{7}{16}$	$3 \times 2\frac{1}{2} \times \frac{6}{16}$	$10\frac{1}{2} \times \frac{10}{16}$	$4\frac{1}{2} \times 4 \times \frac{9}{16}$	$7\frac{1}{2} \times 3 \times \frac{9}{16}$ Bulb Angle.	$6\frac{1}{2} \times 3 \times \frac{8}{16}$ Bulb Angle.	$6 \times 3 \times \frac{8}{16}$
$3 \times 3 \times \frac{6}{16}$	$7\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$11 \times \frac{11}{16}$	$5 \times 4 \times \frac{9}{16}$	$7\frac{1}{2} \times 3 \times \frac{10}{16}$ Bulb Angle.	$7 \times 3 \times \frac{9}{16}$ Bulb Angle.	$6 \times 3 \times \frac{8}{16}$ Bulb Angle.
$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$8 \times \frac{8}{16}$	$3 \times 3 \times \frac{6}{16}$	$11\frac{1}{2} \times \frac{11}{16}$	$5 \times 4 \times \frac{9}{16}$	$8 \times 3 \times \frac{11}{16}$ Bulb Angle.	$7\frac{1}{2} \times 3 \times \frac{10}{16}$ Bulb Angle.	$6\frac{1}{2} \times 3 \times \frac{8}{16}$ Bulb Angle.
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$8\frac{1}{2} \times \frac{8}{16}$	$3 \times 3 \times \frac{7}{16}$	$12 \times \frac{12}{16}$	$5\frac{1}{2} \times 4 \times \frac{9}{16}$			
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9 \times \frac{9}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{16}$	$12 \times \frac{12}{16}$	$6 \times 4 \times \frac{9}{16}$			
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$9\frac{1}{2} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$13 \times \frac{13}{16}$	$6 \times 4 \times \frac{10}{16}$			
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$10 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$13 \times \frac{13}{16}$	$6 \times 4 \times \frac{10}{16}$			

(*a*) The beams at the ends of hatchways from six to ten frame spaces in length, must be equal in size to those of the main deck; and in awning decks and long bridges to be of the size of spar deck beams.

(*b*) These beams are to be formed with either a plate with double angle bars on its upper and lower edges, or a bulb plate with double angle bars and a covering plate on its upper edge. The beam plates and angle bars are to be of the sizes given above, and the broad flanges of the angle bars are to be fitted horizontally; the covering plate is to be of the thickness given for the angle bars.

Strong beams at the spar deck in machinery space may be of the size of main deck beams of the same length, with double angle bars on their upper and lower edges of the size given for the corresponding beam, in "hold beams of extra strength."

Semi-box beams may be adopted in lieu thereof, formed of bulb plate and single angle bars of the sizes given for ordinary beams, secured in the usual way to two consecutive frames, and plated over by plating six-sixteenths of an inch in thickness.

(*c*) Beams to every frame, when eight-sixteenths of an inch thick or above, may be reduced one-sixteenth of an inch in thickness, where less than three-fourths of the length of the amidship beam.

(*d*) Bulb beams of the size required for spar deck beams to be fitted in way of windlass or capstan.

The width of the bulb of bulb plates and tee bulbs to be 3·2 times the thickness of the webs, and in bulb angles $2\frac{1}{2}$ times the thickness of the webs.

IRON VESSELS.

Table of Minimum Dimensions of STRINGE

PLATING NUMBERS OF VESSELS. *(See Section 2.)*	2000 to 3000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Dimensions of Main Stringer Plates.											
Under 10 Depths, or Under 8 Breadths in Length.	20 × 5/16	20 × 6/16	23 × 6/16	26 × 6/16	28 × 6/16	28 × 7/16	30 × 7/16	32 × 7/16	32 × 8/16	34 × 8/16	36 × 8/1
10 to 11 Depths, or 8 to 8½ Breadths.	22 × 5/16	22 × 6/16	25 × 6/16	28 × 6/16	31 × 6/16	32 × 7/16	34 × 7/16	36 × 7/16	36 × 8/16	38 × 8/16	40 × 8/1
11 to 12 Depths, or 8½ to 9 Breadths.	24 × 5/16	25 × 6/16	28 × 6/16	31 × 6/16	34 × 6/16	36 × 7/16	38 × 7/16	40 × 7/16	40 × 8/16	42 × 8/16	44 × 8/1
12 to 13 Depths, or 9 to 9½ Breadths.	24 × 6/16	25 × 7/16	28 × 7/16	31 × 7/16	34 × 7/16	36 × 8/16	38 × 8/16	40 × 8/16	40 × 9/16	42 × 9/16	44 × 9/1
13 to 14 Depths, or 9½ to 10 Breadths.	27 × 6/16	28 × 7/16	31 × 7/16	34 × 7/16	37 × 7/16	40 × 8/16	42 × 8/16	44 × 8/16	44 × 9/16	44 × 9/16 Iron Deck	46 × 9/1 6/16 for H
14 to 15 Depths, or 10 to 10½ Breadths.	30 × 6/16	31 × 7/16	31 × 8/16	34 × 8/16	37 × 8/16	40 × 9/16	42 × 9/16	44 × 9/16	44 × 10/16	46 × 10/16	48 × 10/1 Complet
15 to 16 Depths, or Over 10½ Breadths.	33 × 6/16	34 × 7/16	34 × 8/16	38 × 8/16	40 × 8/16	44 × 9/16	46 × 9/16	48 × 10/16	48 × 10/16	50 × 10/16	52 × 10/1
Ends of Stringer Plates.			15 × 5/16	17 × 5/16	19 × 5/16	19 × 6/16	20 × 6/16	22 × 6/16	22 × 7/16	23 × 7/16	24 × 7/1
Hold and Lower Deck Beam Stringer Plates (extreme breadth).						20 × 6/16	21 × 6/16	22 × 6/16	23 × 7/16	25 × 7/16	27 × 7/1
Ends of ditto.						16 × 5/16	16 × 5/16	17 × 5/16	18 × 6/16	19 × 6/16	21 × 6/1
Tie Plates on Beams, Fore-and-aft, and Diagonals.			7 × 6/16	7 × 6/16	7 × 6/16	8 × 7/16	8 × 7/16	9 × 7/16	9 × 8/16	10 × 8/16	10 × 8/1
Ends of ditto.			7 × 5/16	7 × 5/16	7 × 5/16	8 × 6/16	8 × 6/16	9 × 6/16	9 × 7/16	10 × 7/16	10 × 7/1

1. *The depths for proportions to be taken from upper side of keel to top of upper deck beams in one, two, and three deck ships, and to top of main deck in spar and awning deck vessels; and, in spar-decked vessels, two depths may be taken off the proportions, so that in a spar-decked vessel of thirteen and under fourteen depths in length, the stringers, &c., may be of the sizes given in the above Table for vessels of eleven and under twelve depths in length; and so on.*

2. In *two decked* vessels the stringer plates indicated with regard to the vessel's proportions in the above Table are to be fitted to the upper deck beams.

3. In *three decked* vessels the stringer plates so indicated in the above Table are to be fitted to both upper and middle deck beams.

4. In *spar decked* vessels the stringer plates given in the above Table are to be fitted to the main deck beams; and the stringer plates required for the spar deck beams are to be the breadth of, and may be $\frac{1}{16}$ of an inch less in thickness than the stringer plates given on the upper line of the Table for vessels of the same plating number, and may be reduced at their ends $\frac{1}{16}$ of an inch in thickness, before and abaft the half length amidships, and to the breadth given for the ends of the main deck stringer plate in the Table.

TABLE G 5.

(For Nos. 27000 to 72000 see Continuation.)

13000	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000
36 × 9/16	40 × 9/16	42 × 9/16	42 × 10/16	44 × 10/16	46 × 10/16	48 × 10/16	50 × 10/16	52 × 10/16	54 × 10/16	54 × 10/16 Irn Dk 6/16 ½ Len Amid	56 × 10/16	Complete 58 × 10/16 Irn Dk 6/16
40 × 9/16	44 × 9/16	46 × 9/16	46 × 10/16	48 × 10/16	50 × 10/16	52 × 10/16	52 × 10/16 Irn Dk 6/16	54 × 10/16 for ½ Lgth	56 × 10/16 Amidships	58 × 10/16 Complete	60 × 10/16 Iron	62 × 10/16 Deck 6/16
44 × 9/16	48 × 9/16	50 × 9/16	46 × 10/16 Iron Deck	48 × 10/16 6/16 for Hlf	50 × 10/16 Length	52 × 10/16 Amidships	54 × 10/16 Complete	56 × 10/16 Iron	58 × 10/16 Deck 6/16	60 × 10/16 Complete	62 × 10/16 Iron	64 × 10/16 Deck 7/16
44 × 10/16 Iron Deck	46 × 10/16 6/16 for Hlf	48 × 10/16 Length	50 × 10/16 Amidships	52 × 10/16 Complete	54 × 10/16 Iron	56 × 10/16 Deck 6/16	58 × 10/16	60 × 10/16	62 × 10/16 Complete	64 × 10/16 Iron	66 × 10/16 Deck 7/16	68 × 10/16
46 × 10/16 Len Amids.	48 × 10/16 Complete	50 × 10/16 Iron	52 × 10/16 Deck 6/16	54 × 10/16	58 × 10/16	60 × 10/16	62 × 10/16 Complete	64 × 10/16 Iron	66 × 10/16 Deck 7/16	68 × 10/16	70 × 10/16	Cpl Irn Up Dk 7/16 51 × 10/16 & Mdl Dk ½ L. 7/16
50 × 10/16 Iron	52 × 10/16 Deck 6/16	54 × 10/16	56 × 10/16	58 × 10/16 Complete	62 × 10/16 Iron	64 × 10/16 Deck 7/16	66 × 10/16	68 × 10/16	Complete 46 × 10/16 and Middle	Iron Upper 48 × 10/16 Dk for Half	Deck 7/16 50 × 10/16 Lngth 7/16	Cmpl Iron Upper & 52 × 10/16 Mdl Dk 7/16
54 × 10/16	56 × 10/16	58 × 10/16	60 × 10/16	62 × 10/16	64 × 10/16	Complete 44 × 10/16 and Middle	Iron Upper 45 × 10/16 Dk for Half	Deck 7/16 46 × 10/16 Lngth 7/16	Complete 47 × 10/16 Middle	Iron 48 × 10/16 Deck 7/16	Upper and 50 × 10/16 thick	Cpl Irn Up Dk 8/16 52 × 10/16 and Mdl Dk 7/16
24 × 8/16	26 × 8/16	28 × 8/16	28 × 8/16	29 × 8/16	30 × 8/16	31 × 8/16	32 × 8/16	33 × 8/16	35 × 8/16	36 × 8/16	36 × 8/16	37 × 8/16
28 × 8/16	29 × 8/16	30 × 8/16	31 × 9/16	32 × 9/16	33 × 9/16	34 × 9/16	35 × 9/16	37 × 9/16	38 × 9/16	39 × 9/16	40 × 9/16	41 × 9/16
22 × 7/16	23 × 7/16	24 × 7/16	24 × 8/16	25 × 8/16	26 × 8/16	26 × 8/16	27 × 8/16	28 × 8/16	29 × 8/16	30 × 8/16	31 × 8/16	32 × 8/16
10 × 9/16	11 × 9/16	12 × 9/16	12 × 10/16	13 × 10/16	13 × 10/16	13 × 10/16	14 × 10/16	14 × 10/16	15 × 10/16	15 × 10/16	15 × 10/16	16 × 10/16
10 × 8/16	11 × 8/16	12 × 8/16	12 × 8/16	13 × 8/16	13 × 8/16	13 × 8/16	14 × 8/16	14 × 8/16	15 × 8/16	15 × 8/16	15 × 8/16	16 × 8/16

5. In *awning decked* vessels the stringer plates given in the above Table are to be fitted to the main deck beams, and the stringer plates required for the awning deck beams are to be of the same width as those given in the Table for hold beam stringer plates, and to be of the following thicknesses, viz. :—

In Vessels whose plating number is under 14,000, not less than 6/16 of an inch.

14,000 and under 26,400 „ „ 7/16 „

26,400 „ 30,900 „ „ 8/16 „

6. *All stringer plates* are to maintain their midship breadth for one-half the vessel's length amidships, from thence the breadth may be gradually reduced to that given above for the ends of the vessel.

IRON VESSELS.

Table of Minimum Dimensions of STRING

PLATING NUMBERS OF VESSELS. *(See Section 2.)*	27000	28000	29000	31000	32000	34000	35000	36000	38000	390
Under 10 Depths, or Under 8 Breadths in Length.	60 × 10/16 Cmpl Iron	62 × 10/16 Deck 6/16	65 × 10/16	68 × 10/16 Cmpl Iron	70 × 10/16 Deck 7/16	72 × 10/16	Cmpl Iron 56 × 10/16 & Mid Dk	Up Dk 7/16 57 × 10/16 ½ Lgth 7/16	Cmpl Iron 58 × 10/16 Middle	Upp 59 × Dec
10 to 11 Depths, or 8 to 8½ Breadths.	64 × 10/16	66 × 10/16 Complete	68 × 10/16 Iron	70 × 10/16 Deck 7/16	72 × 10/16	Cmpl Iron 55 × 10/16 & Mid Dk	Up Dk 7/16 56 × 10/16 ½ Lgth 7/16	Cmpl Iron 57 × 10/16 Middle	Upper and 58 × 10/16 Deck 7/16	Cmpl 59 ×
11 to 12 Depths, or 8½ to 9 Breadths.	66 × 10/16 Complete	68 × 10/16 Iron	70 × 10/16 Deck 7/16	Cmpl Iron 54 × 10/16 & Mid Dk	Up Dk 7/16 55 × 10/16 ½ Lgth 7/16	Cmpl Iron 56 × 10/16 Middle	Upper 57 × 10/16 Deck	and 58 × 10/16 7/16	Cmpl Iron 59 × 10/16 and	Upp 60 × Midd
12 to 13 Depths, or 9 to 9½ Breadths.	Cmpl Iron 70 × 10/16 Deck 7/16	Cmpl Iron 53 × 10/16 & Mid Dk	Up Dk 7/16 54 × 10/16 ½ Lgth 7/16	Cmpl Iron 55 × 10/16 Middle	Upper and 56 × 10/16 Deck 7/16	Cmpl Iron 57 × 10/16 and	Upper 58 × 10/16 Middle Dk	Deck 8/16 59 × 10/16 7/16	Cmpl Iron 60 × 10/16 Middle	Upp 61 × Dec
13 to 14 Depths, or 9½ to 10 Breadths.	Cpl Iron Up Dk 7/16 52 × 10/16 & Mdl Dk ½ L 7/16	Cmpl Iron 53 × 10/16 Middle	Upper and 54 × 10/16 Deck 7/16	Cmpl Iron 55 × 10/16 & Middle	Up Dk 8/16 56 × 10/16 Deck 7/16	Cmpl Iron 57 × 10/16 Middle	Upper 58 × 10/16 Deck	and 59 × 10/16 8/16	Cmpl Iron 60 × 10/16 and	Upp 61 × Middl
14 to 15 Depths, or 10 to 10½ Breadths.	Cmpl Iron Upper 53 × 10/16 and Mdl Dk 7/16	Cmpl Iron 54 × 10/16 & Mid Dk	Up Dk 8/16 55 × 10/16 7/16 thick	Cmpl Iron 56 × 10/16 Middle	Upper and 57 × 10/16 Deck 8/16	Cmpl Iron 58 × 10/16 and	Upper 59 × 10/16 Middle Dk	Deck 9/16 60 × 10/16 8/16	Cmpl Iron 61 × 10/16 Middle	Upp 61 × Deck
15 to 16 Depths, or over 10½ Breadths.	Cpl Iron Up Dk 8/16 53 × 10/16 and Mdl Dk 7/16	Cmpl Iron 54 × 10/16 Middle Dk	Upper and 55 × 10/16 8/16 thick							
Ends of Stringer Plates.	38 × 8/16	40 × 8/16	41 × 8/16	42 × 8/16	43 × 8/16	44 × 8/16	45 × 9/16	45 × 9/16	46 × 9/16	47 ×
Hold and Lower Deck Beam Stringer Plates (extreme breadth.)	42 × 9/16	43 × 9/16	44 × 9/16	45 × 9/16	46 × 9/16	47 × 9/16	48 × 9/16	50 × 9/16	51 × 9/16	52 ×
Ends of ditto.	33 × 8/16	33 × 8/16	34 × 8/16	35 × 8/16	36 × 8/16	36 × 8/16	37 × 8/16	38 × 8/16	40 × 8/16	41 ×
Tie Plates on Beams, Fore-and-aft, and Diagonals.	16 × 10/16	17 × 10/16	17 × 10/16	18 × 10/16	18 × 10/16	19 × 10/16	19 × 10/16	20 × 10/16	20 × 10/16	21 ×
Ends of ditto.	16 × 8/16	17 × 8/16	17 × 8/16	18 × 8/16	18 × 8/16	19 × 8/16	19 × 8/16	20 × 8/16	20 × 8/16	21 ×

Dimensions of Main Stringer Plates, &c.

7. Where a reduction of 2/16 of an inch from the midship thickness is allowed for the ends, the stringer plates may be reduced 1/16 of an inch in thickness for one-eighth of the vessel's length before and abaft the half length amidships, and from thence to the ends they may be reduced to the thickness required at ends.

8. Where there is an *iron deck* prescribed either for the entire length of the vessel, or for half the length amidships, it is to be fitted to the upper deck beams in two decked vessels. In three decked vessels and spar-decked vessels it may be fitted either to the upper or middle deck beams.

9. In way of an *iron deck* or *half-iron deck*, the stringer plates may be reduced in width to one inch for every seven feet of the length of the vessel, but the thickness is to be as given above, and at the ends of the vessel the stringer plates to be in accordance with the Table for "ends of stringer plates." Where more than one iron deck is required the stringer plates are to be of the breadth and thickness given in the Table.

10. Where an *iron deck* is prescribed in the Table to be fitted for one half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length, and then tapered gradually into the stringer plates for one-eighth the vessel's length at each end.

TABLE G 5.

(Continued.)

40000	42000	44000	46000	48000	50000	52000	54000	57000	60000	64000	68000	72000
and 60 × 1 0/16 7/16 thick	Cmpl Iron 60 × 1 1/16 and	Upper Dck 62 × 1 1/16 Middle Dk	8/16 thick 64 × 1 1/16 7/16 thick	Cmpl Iron 66 × 1 1/16 Middle	Upper Deck 68 × 1 1/16	and 70 × 1 1/16 8/16	Cmpl Iron 72 × 1 1/16 and	Upper 74 × 1 1/16 Middle Dk	Deck 9/16 76 × 1 1/16 8/16	Cmpl Iron 78 × 1 1/16 Middle	Upper 80 × 1 1/16 Deck	and 82 × 1 1/16 9/16
Upper Dk 60 × 1 0/16 Deck	8/16 and 60 × 1 1/16 7/16 thick	Middle 62 × 1 1/16	Cmpl Iron 64 × 1 1/16 Middle	Upper 66 × 1 1/16 Deck	and 68 × 1 1/16 8/16	Cmpl Iron 70 × 1 1/16 and	Upper Dck 9/16 72 × 1 1/16 Middle Dk	74 × 1 1/16 8/16	Cmpl Iron 76 × 1 1/16 Middle	Upper 78 × 1 1/16 Deck	and 80 × 1 1/16 9/16	3Dks 1 0/16 82 × 1 1/16 9/16 & 7/16
Deck 8/16 60 × 1 1/16 Deck 7/16	Cmpl Iron 62 × 1 1/16 Middle	Upper 64 × 1 1/16 Deck 8/16	and 66 × 1 1/16 thick	Cmpl Iron 68 × 1 1/16 and	Upper Dck 9/16 70 × 1 1/16 Middle Dk	72 × 1 1/16 8/16	74 × 1 1/16	Cmpl Iron 76 × 1 1/16 Middle Dk 9/16	Upper and 78 × 1 1/16	80 × 1 1/16	Cmpl Iron 80 × 1 1/16 Md Dk 9/16	Up Dk 1 0/16 82 × 1 1/16 Lr Dk 7/16
and 61 × 1 1/16 8/16 thick	Cmpl Iron 63 × 1 1/16 and Middle	Upper 65 × 1 1/16 Deck 8/16	Deck 9/16 67 × 1 1/16 thick	69 × 1 1/16	71 × 1 1/16 Cmpl Iron	73 × 1 1/16 Upper and	75 × 1 1/16 Middle Dk	77 × 1 1/16 9/16	Cmpl Iron 78 × 1 1/16 and	Upper Dk 80 × 1 1/16 Lower	1 0/16 Middle 82 × 1 1/16 Deck 7/16	Deck 9/16 82 × 1 1/16 thick
Deck 9/16 61 × 1 1/16 8/16 thick	Cmpl Iron 63 × 1 1/16 Middle	Upper 65 × 1 1/16 Deck 9/16	and 67 × 1 1/16 thick	69 × 1 1/16	Cmpl Iron 71 × 1 1/16 and	Upper Dck 1 0/16 73 × 1 1/16 Lower	Middle 75 × 1 1/16 Deck 7/16	Deck 9/16 77 × 1 1/16 thick	79 × 1 1/16			
and 62 × 1 1/16 thick	Cmpl Iron 64 × 1 1/16 and Lower	Up Dk 1 0/16 66 × 1 1/16 Deck	Md Dk 9/16 68 × 1 1/16 7/16 thick									
48 × 9/16	49 × 9/16	50 × 9/16	51 × 9/16	52 × 9/16	53 × 9/16	54 × 9/16	55 × 9/16	56 × 9/16	57 × 9/16	58 × 9/16	60 × 9/16	62 × 9/16
53 × 1 0/16	54 × 1 0/16	55 × 1 0/16	56 × 1 0/16	57 × 1 0/16	58 × 1 0/16	59 × 1 0/16	60 × 1 0/16	61 × 1 0/16	62 × 1 0/16	63 × 1 0/16	64 × 1 0/16	65 × 1 0/16
41 × 8/16	42 × 8/16	43 × 8/16	44 × 8/16	45 × 8/16	46 × 8/16	47 × 8/16	48 × 8/16	49 × 8/16	50 × 8/16	51 × 8/16	52 × 8/16	53 × 8/16
21 × 1 0/16	22 × 1 0/16	23 × 1 0/16	24 × 1 0/16	25 × 1 0/16	26 × 1 0/16	27 × 1 0/16	28 × 1 0/16	29 × 1 0/16	30 × 1 0/16	31 × 1 0/16	32 × 1 0/16	33 × 1 0/16
21 × 8/16	22 × 8/16	23 × 8/16	24 × 8/16	25 × 8/16	26 × 8/16	27 × 8/16	28 × 8/16	29 × 8/16	30 × 8/16	31 × 8/16	32 × 8/16	33 × 8/16

11. *Orlop stringer plates* where required to be fitted, to be of the same thickness as the hold beam stringer plates, and three-fourths the breadth of the same.

12. Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged, and in addition, where the plating number is 15,000 and above, diagonal tie plates are to be fitted all fore and aft on the upper deck.

13. In sailing vessels whose plating number is under 15,000, and in steam vessels not requiring an iron deck, if *diagonal tie plates* be fitted on the beams in sufficient number, and to the satisfaction of the Surveyor, their breadth as given in the Table may be deducted from the breadth given above for the stringer plates amidships, in which case the stringer plates may be reduced in breadth at the ends of the vessel to three-fourths of their breadth amidships.

14. Tie plates on all tiers of beams to be of the same thickness as the stringer plates of their respective decks.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, London, E.C., 29th November, 1888.

IRON VESSELS.

Additions beyond the requirements contained in th
to depth than in Vessels for whic

Proportion of Depths to Length.	ITEMS.	PLATING — UNDER 10450
Above 11 and not exceeding 12	1 Sheerstrake	1 Add $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
	2 Strake below Sheerstrake	2
	3 Upper deck Stringer plate	3
	4 Middle line Keelson	4
	5 Side Keelson	5
	6 Bilge Keelson	6 Add Bulb for $\frac{1}{2}$ length amidships
	7 Bilge Stringer	7
	8 Bilge Plating	8 One Strake increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
Above 12 and not exceeding 13	1 Sheerstrake	1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships
	2 Strake below Sheerstrake	2
	3 Upper deck Stringer plate	3
	4 Middle line Keelson	4
	5 Side Keelson	5
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7
	8 Bilge Plating	8 Two strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
Above 13 and not exceeding 14	1 Sheerstrake	1 Add Doubling 18 inches wide for $\frac{3}{5}$ length amidships
	2 Strake below Sheerstrake	2
	3 Upper deck Stringer plate	3
	4 Middle line Keelson	4
	5 Side Keelson	5 Double Angle Keelson to be fitted in all cases
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7 Add Bulb for $\frac{1}{2}$ length amidships
	8 Bilge Plating	8 Two Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
Above 14 and not exceeding 15	1 Sheerstrake	1 Add Doubling 20 inches wide for $\frac{3}{4}$ length amidships
	2 Strake below Sheerstrake	2
	3 Upper deck Stringer plate	3
	4 Middle line Keelson	4
	5 Side Keelson	5 Double Angle Keelson and Bulb all fore and aft
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7 Add Bulb for $\frac{1}{3}$ length & Intercostal for $\frac{1}{2}$ length amidships, or
	8 Bilge Plating	8 One Strake doubled for $\frac{1}{2}$ length amidships in lieu of Intercostal
Above 15 and not exceeding 16	1 Sheerstrake	1
	2 Strake below Sheerstrake	2
	3 Second Strake below Sheerstrake	3
	4 Upper deck Stringer plate	4
	5 Middle line Keelson	5
	6 Side Keelson	6
	7 Bilge Keelson	7
	8 Bilge Stringer	8
	9 Bilge Plating	9

For all Vessels exceeding in length sixteen depths to the Middle Deck, plans must be submitted for the approval of the Committee for giving the vessels sufficient additional strength longitudinally; and all vessels having a length of thirteen depths and above to the Upper Deck are to have a substantial erection extending over the midship half length of the Vessel. *See also Section 46.*

Where Bulb plates are required they are to be of the size given in Table G 4 for the midship hold beams, or for main deck beams, in vessels with one deck.

Rules ; for Vessels of greater proportionate length the ordinary Scantlings are provided.

TABLE G 6.

(For Nos. 18700 to 40000 see continuation.)

NUMBERS.

10450 and under 15500	15500 and under 18700
1 Add $\frac{1}{16}$ for $\frac{3}{5}$ length amidships	1 Add $\frac{1}{16}$ for $\frac{3}{4}$ length amidships .. ..
2	2 .. ..
3	3 .. ..
4	4 .. ..
5	5 .. ..
6 Add Bulb for $\frac{1}{2}$ length amidships..	6 Add Bulb for $\frac{1}{2}$ length amidships.. .. ..
7	7 .. ..
8 One Strake increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships	8 One Strake increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships .. ..
1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships	1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{1}{16}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{1}{16}$ for $\frac{1}{2}$ length amidships .. ..
3	3 .. ..
4	4 .. ..
5	5 .. ..
6 Add Bulb for $\frac{3}{5}$ length amidships..	6 Add Bulb for $\frac{3}{5}$ length amidships.. .. ..
7	7 .. ..
8 Two Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships	8 Two Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships .. ..
1 Add Doubling 20 inches wide for $\frac{3}{5}$ length amidships.. ..	1 Add Doubling whole width below stringer for $\frac{3}{5}$ length amids.
2	2 .. ..
3	3 .. ..
4	4 .. ..
5 Add Intercostal	5 .. ..
6 Add Bulb for $\frac{3}{5}$ length amidships..	6 Add Bulb for $\frac{3}{5}$ length amidships.. .. ..
7 Add Bulb for $\frac{1}{2}$ length where no hold beams	7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. .. ..
8 Two Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships	8 Three Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships .. ..
1 Add Doubling whole width below stringer for $\frac{3}{4}$ length amids.	1 Add Doubling whole width below stringer for $\frac{3}{4}$ length amids.
2	2 .. ..
3	3 Add $\frac{1}{16}$ for $\frac{1}{2}$ length amidships .. ..
4	4 .. ..
5 Add Intercostal	5 .. ..
6 Add Bulb for $\frac{3}{5}$ length amidships..	6 Add Bulb for $\frac{3}{5}$ length amidships.. .. ..
7 Add Intercostal for $\frac{1}{2}$ length amidships, or	7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. .. ..
8 One Strake doubled for $\frac{1}{2}$ length amidships	8 One Strake doubled for $\frac{1}{2}$ length amidships .. .. ..
1 Add Doubling whole width below stringer for $\frac{3}{4}$ length amids.	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{1}{16}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships .. ..
3	3 .. ..
4	4 .. ..
5	5 .. ..
6 Add Intercostal	6 .. ..
7 Add Bulb for $\frac{3}{5}$ length amidships..	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8 Add Intercostal for $\frac{1}{2}$ length amidships, or	8 Add Intercostal for $\frac{1}{2}$ length amidships, or .. .. ..
9 One Strake doubled for $\frac{1}{2}$ length amidships	9 One Strake doubled for $\frac{1}{2}$ length amidships .. .. ..

All Vessels, excepting those with an awning deck, whose plating number exceeds 35,000 and exceeding 16 depths in length, taken from the main deck, are to have the whole of the reverse frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-decked vessels they are all to extend to the main deck.

IRON VESSELS.

Additions beyond the requirements contained in the to depth than in Vessels for which

Proportion of Depths to Length.	ITEMS.	PLATING 18700 and under 26000
Above 11 and not exceeding 12	1 Sheerstrake	1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships
	2 Strake below Sheerstrake	2 ..
	3 Upper deck Stringer plate	3 ..
	4 Middle line Keelson	4 ..
	5 Side Keelson	5 ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7 ..
	8 Bilge Plating	8 Two Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
Above 12 and not exceeding 13	1 Sheerstrake	1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships
	2 Strake below Sheerstrake	2 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships
	3 Upper deck Stringer plate	3 ..
	4 Middle line Keelson	4 ..
	5 Side Keelson	5 ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7 Add Intercostal for $\frac{1}{2}$ length amidships, or
	8 Bilge Plating	8 Three Strakes increased $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
Above 13 and not exceeding 14	1 Sheerstrake	1 Add Doubling whole width below Stringer for $\frac{3}{5}$ length amids.
	2 Strake below Sheerstrake	2 ..
	3 Upper deck Stringer plate	3 Add $\frac{1}{16}$ for $\frac{1}{2}$ length amidships
	4 Middle line Keelson	4 ..
	5 Side Keelson	5 ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7 Add Intercostal for $\frac{1}{2}$ length amidships
	8 Bilge Plating	8 ..
Above 14 and not exceeding 15	1 Sheerstrake	1 Add Doubling whole width for $\frac{3}{4}$ lengths amidships
	2 Strake below Sheerstrake	2 ..
	3 Upper deck Stringer plate	3 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships
	4 Middle line Keelson	4 To be $\frac{1}{4}$ deeper than in Table G 3.
	5 Side Keelson	5 Add Bulb for $\frac{1}{2}$ length amidships
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships
	7 Bilge Stringer	7 Add Intercostal for $\frac{1}{2}$ length amidships
	8 Bilge Plating	8 ..
Above 15 and not exceeding 16	1 Sheerstrake	1 Add Doubling whole width for $\frac{3}{4}$ length amidships
	2 Strake below Sheerstrake	2 Add Doubling whole width for $\frac{1}{2}$ length amidships
	3 Second Strake below Sheerstrake	3 ..
	Upper deck Stringer Plate	4 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships
	5 Middle line Keelson	5 To be $\frac{1}{4}$ deeper than in Table G 3.
	6 Side Keelson	6 Add Bulb for $\frac{1}{2}$ length amidships
	7 Bilge Keelson	7 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships
	8 Bilge Stringer	8 Add Intercostal for $\frac{3}{5}$ length amidships
	9 Bilge Plating	9 ..

(*a*) Continuous plate Keelson standing on the floors and attached to Intercostal Keelson plates, having double angles on upper and lower edges of the sizes given in Table G 3, the plate to be of sufficient depth to take the deep flanges of the angles, and to be of the thickness given in Table G 3 for middle line Keelsons.

(*b*) Continuous plate Keelson standing on the floors and attached to Intercostal Keelson plates, having double angles on upper and lower edges of the sizes given in Table G 3, the plate to be three-fourths the depth given in Table G 3 for middle line Keelsons, and of the same thickness.

Rules ; for Vessels of greater proportionate length the ordinary Scantlings are provided.

TABLE G 6. *(continued.)*

NUMBERS.

26000 and under 35000	35000 and under 40000
1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships	1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships .. ..
3	3 .. ..
4	4 .. ..
5 Add Bulb for $\frac{1}{2}$ length amidships..	5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships
7 Add Intercostal for $\frac{1}{2}$ length amidships..	7 Add Intercostal for $\frac{3}{5}$ length amidships.. .. .. ..
8	8 .. ..
1 Add $\frac{2}{16}$ for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{2}{16}$ for $\frac{1}{2}$ length amidships	2 .. ..
3 Add $\frac{2}{16}$ for $\frac{3}{5}$ length amidships	3 Add $\frac{2}{16}$ for $\frac{3}{5}$ length amidships .. ..
4	4 .. ..
5 Add Bulb for $\frac{1}{2}$ length amidships..	5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships.. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships
7 Add Intercostal for $\frac{1}{2}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add Doubling whole width for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2	2 Add Doubling whole width for $\frac{1}{2}$ length amidships .. ..
3 Add $\frac{2}{16}$ for $\frac{3}{5}$ length amidships	3 Add $\frac{2}{16}$ for $\frac{3}{5}$ length amidships .. ..
4 To be $\frac{1}{4}$ deeper than in Table G 3.	4 To be $\frac{1}{4}$ deeper than in Table G 3. .. ..
5 Add Bulb for $\frac{1}{2}$ length amidships..	5 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships
7 Add Intercostal for $\frac{3}{5}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add Doubling whole width for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add Doubling whole width for $\frac{1}{2}$ length amidships	2 Add Doubling whole width for $\frac{1}{2}$ length amidships .. ..
3 Add $\frac{2}{16}$ for $\frac{3}{5}$ length amidships	3 Add Doubling 42 inches wide for $\frac{3}{5}$ length amidships.. ..
4 To be $\frac{1}{4}$ deeper than in Table G 3.	4 To be $\frac{1}{4}$ deeper than in Table G 3. .. ..
5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships	5 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{3}{5}$ length amidships	6 Add plate Keelson (*a*) for $\frac{1}{2}$ length & Intl. for $\frac{3}{5}$ length amids.
7 Add Intercostal for $\frac{3}{5}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add Doubling whole width for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add Doubling whole width for $\frac{3}{5}$ length amidships	2 Add Doubling whole width for $\frac{3}{5}$ length amidships .. ..
3	3 Add Doubling whole width for $\frac{1}{2}$ length amidships .. ..
4 Add Doubling 40 inches wide for $\frac{1}{2}$ length amidships.. ..	4 Add Doubling 50 inches wide for $\frac{3}{5}$ length amidships.. ..
5 To be $\frac{1}{4}$ deeper than in Table G 3.	5 To be $\frac{1}{4}$ deeper than in Table G 3. .. ..
6 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships	6 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.. .. ..
7 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{3}{5}$ length amidships	7 Add plate Keelson (*b*) for $\frac{1}{2}$ length and Intl. for $\frac{3}{5}$ length amids.
8 Add Intercostal for $\frac{3}{5}$ length amidships	8 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
9	9 .. ..

In lieu of the doubling plates required above, the thickness of the Sheerstrake, the strake next below the Sheerstrake, and the upper deck stringer plate may be increased in thickness to afford equivalent strength. In vessels where the plating number is over 28,000, and double butt straps are not required by Section 20, paragraph 8, such straps are to be fitted to the butts of the Sheerstrake.

LLOYDS' REGISTER OF SHIPPING, 2, WHITE LION COURT, CORNHILL, LONDON, E.C.
14th December, 1893.

IRON VESSELS.

TABLE G 7.

Table of Scantlings for DOUBLE BOTTOMS CONSTRUCTED ON THE CELLULAR SYSTEM.

PLATING NUMBER FOR REGULATING SCANTLINGS. *(See Section 2.)*	Centre Girder. — Depth above Top of Keel and Thickness.	Thickness of Side Girders	Number of Side Girders (exclusive of Margin Plates) on each side, with Floors at alternate Frames.	Margin Plate. — Depth (exclusive of Flange) and Thickness.	Thickness of Inner Bottom Plating.				Thickness of Brack't or Floor Plates.	DIMENSIONS OF ANGLE BARS.		
					Middle Line Strake. (*b*)		In Engine and Boiler Space.	In Holds.		On Centre Girder. (*a*)	On Margin Plates.	On Side Girders, Intermediate, and Vertical Angle Bars.
					Amidships.	Ends.						
	inches.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Under 11,000	$32 \times \frac{8}{16}$	$\frac{5}{16}$	2	$18 \times \frac{6}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 2\frac{1}{2} \times \frac{5}{16}$
11,000 and under 13,000	$33 \times \frac{8}{16}$	$\frac{6}{16}$	2	$19 \times \frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 2\frac{1}{2} \times \frac{6}{16}$
13,000 and under 15,000	$34 \times \frac{8}{16}$	$\frac{6}{16}$	3	$20 \times \frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$
15,000 and under 18,000	$35 \times \frac{9}{16}$	$\frac{6}{16}$	3	$21 \times \frac{7}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$4 \times 4 \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{6}{16}$
18,000 and under 21,000	$36 \times \frac{9}{16}$	$\frac{6}{16}$	3	$22 \times \frac{7}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3 \times 3 \times \frac{7}{16}$
21,000 and under 24,000	$38 \times \frac{10}{16}$	$\frac{6}{16}$	3	$24 \times \frac{7}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{6}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$
24,000 and under 28,000	$40 \times \frac{10}{16}$	$\frac{7}{16}$	3	$26 \times \frac{7}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$
28,000 and under 33,000	$42 \times \frac{10}{16}$	$\frac{7}{16}$	3	$28 \times \frac{8}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$4 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$
33,000 and under 38,000	$44 \times \frac{10}{16}$	$\frac{7}{16}$	4	$30 \times \frac{8}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$4 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$
38,000 and under 44,000	$46 \times \frac{10}{16}$	$\frac{8 \text{ to } 7}{16}$	4	$32 \times \frac{9}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$\frac{8 \text{ to } 7}{16}$	$\frac{8 \text{ to } 7}{16}$	$4 \times 4 \times \frac{10}{16}$	$4 \times 4 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$
44,000 and under 51,000	$48 \times \frac{11}{16}$	$\frac{8}{16}$	4	$34 \times \frac{10}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$\frac{8}{16}$	$4 \times 4 \times \frac{10}{16}$	$4 \times 4 \times \frac{10}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{16}$

(*a*) Where Flat Plate Keels are adopted, the Angles connecting the same to the centre Plate are to be of the size required for Middle Line Keelsons in Table G 3.

(*b*) The breadth of the Middle Line Strake of the inner bottom plating to be not less than that given for Garboard Strakes in Table G 2.

The Floor plates and other parts of the inner bottom in the Boiler space to be $\frac{1}{16}$th of an inch thicker than given in the above Table.

Lloyd's Register of Shipping,
2, White Lion Court, Cornhill, London, E.C.
13th April, 1893.

IRON VESSELS. TABLE G 8.

Showing diameters and spacing of Rivets and breadths of Straps, Lapped Butts and Edge Laps.

		ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Thickness of PLATES		$\frac{5}{16}$	$\frac{6}{16}$	$\frac{6\ \&\ 7}{16}$ altrntly.	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{9\ \&\ 10}{16}$ altrntly.	$\frac{10}{16}$ (b)	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12\ \&\ 13}{16}$ altrntly.	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{16}{16}$
Diameter of RIVETS		$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$
Breadth of TREBLE rivetted STRAPS		...	...	...	...	$14\frac{1}{4}$	$14\frac{1}{4}$	$14\frac{1}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	19	19	19	$21\frac{1}{4}$	$21\frac{1}{4}$
„ „ DOUBLE „ „		8	8	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	...	...	...	...	...
„ „ TREBLE BUTT LAPS		...	...	...	...	$7\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{1}{2}$	9	9	9	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	...	...
„ „ DOUBLE „ „		$4\frac{1}{4}$	$4\frac{1}{4}$	5	5	5	5	5	6	6	6	...	...	...	...	...
„ „ DOUBLE „ EDGE LAPS		$3\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	6	6	6	$6\frac{3}{4}$	$6\frac{3}{4}$
„ „ SINGLE „ „		$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	...	...	...	...	...	...	...	...	...	...
MAXIMUM Spacing of Rivets from centre to centre	In BUTTS of outside plating	$2\frac{1}{2}$	$2\frac{1}{2}$	3	3	3	3	3	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$
	In EDGES (forward and aft)	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	5	5
	In FRAMES	5	5	6	6	6	6	6	7	7	7	8	8	8	...	...

Minimum number of Rivets in edges of Plating between Frames AMIDSHIPS.

DIAMETER OF RIVETS	NUMBER OF RIVETS IN EACH ROW.														
	ins. $\frac{5}{8}$	ins. $\frac{5}{8}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{7}{8}$	ins. $\frac{7}{8}$	ins. $\frac{7}{8}$	ins. 1	ins. 1	ins. 1	ins. $1\frac{1}{8}$	ins. $1\frac{1}{8}$
Spacing of FRAMES 20 ins.	7	7	5	5	5	5	...	...	...	...	...	...	...	...	...
„ „ „ 21 „	...	7	6	6	6	6	6	5	5	...	...	...	...	...	...
„ „ „ 22 „	...	...	6	6	6	6	6	5	5	5	...	...	...	...	...
„ „ „ 23 „	...	...	6	6	6	6	6	5	5	5	5	5	5	...	...
„ „ „ 24 „	...	...	7	7	7	7	7	6	6	6	5	5	5	...	...
„ „ „ 25 „	...	...	...	...	...	...	...	6	6	6	5	5	5	...	...
„ „ „ 26 „	...	...	...	...	...	...	...	...	...	...	...	5	5	5	5

Where the fore and aft flange of the frame does not exceed 3 inches, the rivets attaching the outside Plating thereto should not exceed $\frac{7}{8}$ inch in diameter, and where it is $3\frac{1}{2}$ inches wide, they should not exceed 1 inch in diameter.

(b) *Where stringer and tie plates are $\frac{10}{16}$ of an inch thick, they should be secured to the beams with $\frac{3}{4}$ of an inch rivets.*

RIVETS to be $\frac{1}{4}$ of an inch larger in diameter in **STEM, STERN FRAME,** and **KEEL,** but in no case need these exceed $1\frac{1}{4}$ inches in diameter, and to be spaced 5 diameters apart.

RIVETS in **RUDDER** to be of not less size than required for the upper edge of garboard strake amidships, spaced not more than 5 diameters apart.

RIVETS connecting flat **KEEL PLATES** and the fore and aft **ANGLES** to be spaced not more than 5 diameters apart.

RIVETS in the **BUTTS** of deck plating to be spaced 4 diameters, and in the edges 4 to $4\frac{1}{2}$ diameters apart.

RIVETS in the **BUTTS** and **EDGES** of inner bottom plating, and in butts of girders to be spaced not more than 4 diameters apart.

RIVETS in the **LANDS** and **BUTTS** of mast plates to be spaced 5 diameters apart.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, London, E.C., 1st October, 1891

IRON AND STEEL MASTS.

EXTREME LENGTH (See Footnote).		PARTNERS.			HEEL.			HOUNDS.			HEAD.			Sizes of Angle Bars in Masts.	
		Diam.	Thickness.		Diam.	Thickness.		Diam.	Thickness.		Diam.	Thickness.			
			Iron.	Steel.		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.	Iron.	Steel.
	Ft.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Two Plates in the Round.	48	16	5/16	6/20	13	4/16	5/20	13 1/2	4/16	5/20	11	3/16	3/16	...	...
	51	17	5/16	6/20	13 1/2	4/16	5/20	14	4/16	5/20	11 1/2	4/16	5/20	...	...
	54	18	5/16	6/20	14	4/16	5/20	15	4/16	5/20	12	4/16	5/20	...	...
	57	19	6/16	7/20	15	5/16	6/20	15 1/2	5/16	6/20	12 1/2	4/16	5/20	...	...
	60	20	6/16	7/20	16	5/16	6/20	16 1/2	5/16	6/20	13 1/2	5/16	6/20	...	...
	63	21	6/16	7/20	16 1/2	5/16	6/20	17 1/2	5/16	6/20	14	5/16	6/20	...	...
	66	22	6/16	7/20	17	5/16	6/20	18 1/2	5/16	6/20	14 1/2	5/16	6/20	...	...
	69	23	6/16	7/20	18	5/16	6/20	19	5/16	6/20	15 1/2	5/16	6/20	...	...
	72	24	6/16	7/20	19	5/16	6/20	20	5/16	6/20	16	5/16	6/20	...	...
Three Plates in the Round.	75	25	7/16	8/20	19 1/2	6/16	7/20	21	6/16	7/20	16 1/2	6/16	7/20	...	...
	78	26	7/16	8/20	20	6/16	7/20	21 1/2	6/16	7/20	17 1/2	6/16	7/20	...	...
	81	27	8/16	9/20	21	6/16	7/20	22 1/2	6/16	7/20	18	6/16	7/20	...	...
	84	28	8/16	9/20	22	6/16	7/20	23	6/16	7/20	18 1/2	6/16	7/20	3 1/2 × 3 × 7/16	3 1/2 × 3 × 8/20
	87	29	8/16	9/20	22 1/2	6/16	7/20	24	6/16	7/20	19 1/2	6/16	7/20	4 × 3 × 7/16	4 × 3 × 8/20
	90	30	8/16	9/20	23	7/16	8/20	25	7/16	8/20	20	6/16	7/20	4 × 3 × 8/16	4 × 3 × 9/20
	93	31	9/16	10/20	24	7/16	8/20	26	7/16	8/20	20 1/2	6/16	7/20	4 1/2 × 3 × 8/16	4 1/2 × 3 × 9/20
	96	32	9/16	10/20	25	7/16	8/20	26 1/2	7/16	8/20	21	6/16	7/20	5 × 3 × 8/16	5 × 3 × 9/20

FOOTNOTE.—The length for regulating the scantlings of the mast

RULES FOR THE CONSTRUCTION OF IRON

1. If Iron be used in the construction of masts, bowsprits, and yards, it is to be of good malleable quality quite free from surface o other defects, and to stand a tensile strain of 20 tons to the square inch and the following bending tests when cold without fracture:—

Thickness of Plates	To Bend Cold through an Angle of	
	With the Grain.	Across the Grain.
9/16	25°	8°
8/16	30°	11°
7/16	37°	13°
6/16	47°	15°
5/16	55°	17°
4/16	65°	20°
3/16	70°	25°

2. The plates to be bent over a slab, the corner of which should be rounded with a radius of half an inch.

3. If Steel be adopted it is to be of the quality required for ship plates and subjected to the same tests.

4. Lower Masts.—The plating to be of the thickness, and the plates arranged as in the Table. The seams to be double riveted; in masts of less length than 84 feet, the edges may be single riveted provided angle bars be fitted to the satisfaction of the Committee. The butts below the mast partners in masts, and those inside the wedging of bowsprits, might be double riveted, the remainder should be treble riveted.

5. The buttstraps in all cases should be 1/16 of an inch thicker than the plates they connect, in iron masts; in steel masts the buttstraps should be 1/20 of an inch thicker than the plates in double riveted butts and 2/20 thicker in treble riveted butts. The buttstraps would be better to be fitted on the outside of the masts and bowsprit.

6. The mast and bowsprit plates should be doubled all round in way of the wedging, or otherwise efficiently strengthened; where masts are wedged at the lower deck, the doubling should extend from below the lower deck to above the upper deck.

7. The heels of all masts and their steps should be efficiently strengthened. The cheeks of masts should be stiffened by angles or cope iron on their foremost edges; or by some other approved plan.

8. Where two plates in the round are adopted instead of three, the iron is to be of such superior quality as to admit of its being bent to the required form, without being unduly heated and without fracture, and in all such cases the masts should be additionally stiffened by 3 angles as provided for in the Tables.

Lloyd's Register of British & Foreign Shipping, 2, White Lion Court, Cornhill, London, E.C.—28th April, 18

IRON AND STEEL BOWSPRITS.

LENGTH OUTSIDE BED.	BED.			HEEL.			CAP.			Sizes of Angle Bar.	
	Diam.	Th'kn'ss		Diam.	Th'kn'ss		Diam.	Th'kn'ss			
		Irn.	Stl.		Irn.	Stl.		Irn.	Stl.	Iron.	Steel.
Ft.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
14	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	14	$\frac{5}{16}$	$\frac{6}{20}$	12	$\frac{4}{16}$	$\frac{5}{20}$	$2\frac{1}{2}\times2\times\frac{5}{16}$	$2\frac{1}{2}\times2\times\frac{6}{20}$
15	$17\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	15	$\frac{5}{16}$	$\frac{6}{20}$	$12\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$2\frac{1}{2}\times2\times\frac{5}{16}$	$2\frac{1}{2}\times2\times\frac{6}{20}$
16	19	$\frac{5}{16}$	$\frac{6}{20}$	16	$\frac{5}{16}$	$\frac{6}{20}$	13	$\frac{5}{16}$	$\frac{6}{20}$	$3\times2\times\frac{5}{16}$	$3\times2\times\frac{6}{20}$
17	20	$\frac{6}{16}$	$\frac{7}{20}$	17	$\frac{6}{16}$	$\frac{7}{20}$	14	$\frac{5}{16}$	$\frac{6}{20}$	$3\times2\times\frac{5}{16}$	$3\times2\times\frac{6}{20}$
18	$21\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	18	$\frac{6}{16}$	$\frac{7}{20}$	15	$\frac{5}{16}$	$\frac{6}{20}$	$3\times2\frac{1}{2}\times\frac{5}{16}$	$3\times2\frac{1}{2}\times\frac{6}{20}$
19	23	$\frac{6}{16}$	$\frac{7}{20}$	19	$\frac{6}{16}$	$\frac{7}{20}$	16	$\frac{5}{16}$	$\frac{6}{20}$	$3\times3\times\frac{6}{16}$	$3\times3\times\frac{7}{20}$
20	$24\frac{1}{2}$	$\frac{7}{16}$	$\frac{8}{20}$	20	$\frac{6}{16}$	$\frac{7}{20}$	$16\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$3\frac{1}{2}\times3\times\frac{6}{16}$	$3\frac{1}{2}\times3\times\frac{7}{20}$
21	$25\frac{1}{2}$	$\frac{7}{16}$	$\frac{8}{20}$	21	$\frac{6}{16}$	$\frac{7}{20}$	$17\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$3\frac{1}{2}\times3\times\frac{6}{16}$	$3\frac{1}{2}\times3\times\frac{7}{20}$
22	$26\frac{1}{2}$	$\frac{7}{16}$	$\frac{8}{20}$	22	$\frac{6}{16}$	$\frac{7}{20}$	$18\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$4\times3\times\frac{7}{16}$	$4\times3\times\frac{8}{20}$
23	28	$\frac{8}{16}$	$\frac{9}{20}$	23	$\frac{7}{16}$	$\frac{8}{20}$	19	$\frac{6}{16}$	$\frac{7}{20}$	$4\times3\frac{1}{2}\times\frac{7}{16}$	$4\times3\frac{1}{2}\times\frac{8}{20}$
24	29	$\frac{8}{16}$	$\frac{9}{20}$	24	$\frac{7}{16}$	$\frac{8}{20}$	20	$\frac{6}{16}$	$\frac{7}{20}$	$4\times3\frac{1}{2}\times\frac{7}{16}$	$4\times3\frac{1}{2}\times\frac{8}{20}$
25	30	$\frac{8}{16}$	$\frac{9}{20}$	25	$\frac{7}{16}$	$\frac{8}{20}$	21	$\frac{6}{16}$	$\frac{7}{20}$	$4\frac{1}{2}\times3\frac{1}{2}\times\frac{8}{16}$	$4\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$
26	$31\frac{1}{2}$	$\frac{8}{16}$	$\frac{9}{20}$	26	$\frac{7}{16}$	$\frac{8}{20}$	$21\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$4\frac{1}{2}\times3\frac{1}{2}\times\frac{8}{16}$	$4\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$
27	33	$\frac{8}{16}$	$\frac{9}{20}$	27	$\frac{7}{16}$	$\frac{8}{20}$	22	$\frac{6}{16}$	$\frac{7}{20}$	$4\frac{1}{2}\times3\frac{1}{2}\times\frac{8}{16}$	$4\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$

CHEEKS.

Th'kn'ss of Plate.		Sizes of Angle Bar.	
Irn.	Stl.	Iron.	Steel.
ins.	ins.	ins.	ins.
$\frac{7}{16}$	$\frac{8}{20}$	$3\frac{1}{2}\times2\frac{1}{2}\times\frac{6}{16}$	$3\frac{1}{2}\times2\frac{1}{2}\times\frac{7}{20}$
$\frac{7}{16}$	$\frac{8}{20}$	$3\frac{1}{2}\times3\times\frac{6}{16}$	$3\frac{1}{2}\times3\times\frac{7}{20}$
$\frac{7}{16}$	$\frac{8}{20}$	$3\frac{1}{2}\times3\times\frac{6}{16}$	$3\frac{1}{2}\times3\times\frac{7}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\times3\times\frac{7}{16}$	$4\times3\times\frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\times3\times\frac{7}{16}$	$4\times3\times\frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\times3\times\frac{7}{16}$	$4\times3\times\frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\frac{1}{2}\times3\times\frac{7}{16}$	$4\frac{1}{2}\times3\times\frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\frac{1}{2}\times3\times\frac{8}{16}$	$4\frac{1}{2}\times3\times\frac{9}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\frac{1}{2}\times3\times\frac{8}{16}$	$4\frac{1}{2}\times3\times\frac{9}{20}$
$\frac{9}{16}$	$\frac{10}{20}$	$5\times3\times\frac{8}{16}$	$5\times3\times\frac{9}{20}$
$\frac{9}{16}$	$\frac{10}{20}$	$5\times3\times\frac{9}{16}$	$5\times3\times\frac{10}{20}$
$\frac{9}{16}$	$\frac{10}{20}$	$5\times3\frac{1}{2}\times\frac{9}{16}$	$5\times3\frac{1}{2}\times\frac{10}{20}$
$\frac{10}{16}$	$\frac{11}{20}$	$5\times3\frac{1}{2}\times\frac{9}{16}$	$5\times3\frac{1}{2}\times\frac{10}{20}$
$\frac{10}{16}$	$\frac{11}{20}$	$5\frac{1}{2}\times4\times\frac{10}{16}$	$5\frac{1}{2}\times4\times\frac{11}{20}$
$\frac{10}{16}$	$\frac{11}{20}$	$6\times4\times\frac{10}{16}$	$6\times4\times\frac{11}{20}$
$\frac{11}{16}$	$\frac{12}{20}$	$6\times4\times\frac{10}{16}$	$6\times4\times\frac{11}{20}$
$\frac{11}{16}$	$\frac{12}{20}$	$6\times4\times\frac{10}{16}$	$6\times4\times\frac{11}{20}$

to be taken, in all cases, from the cap to the top of the keelson.

AND STEEL MASTS, BOWSPRITS, AND YARDS.

9. All masts of 84 feet length and above, to be fitted with angles properly shifted and extending the whole length of the mast. If the plates be arranged as described in the Tables, there should be an angle bar fitted to each plate in the round, of the size given in the Table.

10. All bowsprits exceeding 28 inches in diameter should have a vertical diaphragm plate extending from within the wedging to the gammoning, connected by continuous single angle bars to the upper and lower parts of the bowsprit, and two additional angle bars of the size given in the Table; and bowsprits 28 inches in diameter and under, to have an angle bar at the centre of each plate extending the whole length of the bowsprit.

11. The diameter of the lower masts at the cap to be in no case less than that of the topmast at this place, or of the lower topsail yard.

12. The attention of the Surveyors is to be specially directed to the fittings connected with the masts and rigging, in order to ensure the workmanship, material, and sizes of the same being efficient.

13. The mizenmasts for barques may be reduced one-fifth in diameter from that given in the Table, and the plating to be not less than the thickness corresponding to the diameters.

14. Where a Steamer is intended to be fitted with masts or a bowsprit for auxiliary purposes, they may be one-eighth less in diameter than prescribed by Table; and when a mast of a steamer is to carry fore and aft sail only, the diameter may be one-fifth less than given in the Table. The seams of these masts may be single riveted.

15. When pole masts are fitted, the length of the lower mast, in determining the diameter and thickness of plating, should be taken from the heel to the cap band, so as to include the head, as in an ordinary mast; and in sailing vessels these masts to be additionally strengthened by angles from below the lower yard to the topmast cap, or compensating strength furnished. The cheek plates in pole masts may be of the same thickness as the mast plates at the hounds.

16. The eye-bolts, hoops, cleats and bands, are to be of the best description of wrought iron.

17. Any deviations from these Rules and Tables must be submitted for the consideration of the Committee.

YARDS.

Length Cleated.	Centre.			First Quarter.			Second Quarter.			Third Quarter.			Ends at Cleats.		
	Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.	
		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.
Feet.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
32	8	3/16	3/16	7 7/8	3/16	3/16	7 1/4	3/16	3/16	6	3/16	3/16	4	2/16	2/16
36	9	3/16	3/16	8 3/4	3/16	3/16	8 1/8	3/16	3/16	6 3/4	3/16	3/16	4 1/2	2/16	2/16
40	10	3/16	3/16	9 3/4	3/16	3/16	9	3/16	3/16	7 1/2	3/16	3/16	5	2/16	2/16
44	11	3/16	3/16	10 3/4	3/16	3/16	10	3/16	3/16	8 1/4	3/16	3/16	5 1/2	2/16	2/16
48	12	4/16	5/20	11 3/4	4/16	5/20	10 3/4	3/16	3/16	9	3/16	3/16	6	2/16	2/16
52	13	4/16	5/20	12 5/8	4/16	5/20	11 3/4	3/16	3/16	9 3/4	3/16	3/16	6 1/2	2/16	2/16
56	14	4/16	5/20	13 5/8	4/16	5/20	12 5/8	4/16	5/20	10 1/2	3/16	3/16	7	2/16	2/16
60	15	4/16	5/20	14 5/8	4/16	5/20	13 1/2	4/16	5/20	11 1/4	3/16	3/16	7 1/2	2/16	2/16
64	16	5/16	6/20	15 5/8	5/16	6/20	14 3/8	5/16	6/20	12	4/16	5/20	8	3/16	3/16
68	17	5/16	6/20	16 1/2	5/16	6/20	15 1/4	5/16	6/20	12 3/4	4/16	5/20	8 1/2	3/16	3/16
72	18	5/16	6/20	17 1/2	5/16	6/20	16 1/4	5/16	6/20	13 1/2	4/16	5/20	9	3/16	3/16
76	19	6/16	7/20	18 1/2	5/16	6/20	17 1/8	5/16	6/20	14 1/4	4/16	5/20	9 1/2	3/16	3/16
80	20	6/16	7/20	19 1/2	5/16	6/20	18	5/16	6/20	15	4/16	5/20	10	3/16	3/16
84	21	7/16	8/20	20 1/2	6/16	7/20	19	5/16	6/20	15 3/4	5/16	6/20	10 1/2	4/16	5/20
88	22	7/16	8/20	21 1/2	6/16	7/20	19 3/4	5/16	6/20	16 1/2	5/16	6/20	11	4/16	5/20
92	23	7/16	8/20	22 1/2	6/16	7/20	20 3/4	6/16	7/20	17 1/4	5/16	6/20	11 1/2	4/16	5/20
96	24	7/16	8/20	23 3/8	6/16	7/20	21 5/8	6/16	7/20	18	5/16	6/20	12	4/16	5/20

TABLE 10.

and FULL-RIGGED STEAM VESSELS.

TOPMASTS.

Length.	Heel.			Lower Part of Head.			Head.		
	Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.	
		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.
Feet.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
32	12	4/16	5/20	10½	4/16	5/20	9	3/16	3/16
34	12½	4/16	5/20	11	4/16	5/20	9½	3/16	3/16
36	13	4/16	5/20	11½	4/16	5/20	10	3/16	3/16
38	14	4/16	5/20	12½	4/16	5/20	10½	3/16	3/16
40	14½	4/16	5/20	13	4/16	5/20	11	3/16	3/16
42	15	5/16	6/20	13½	4/16	5/20	11½	4/16	5/20
44	16	5/16	6/20	14	4/16	5/20	12	4/16	5/20
46	16½	5/16	6/20	14½	4/16	5/20	12½	4/16	5/20
48	17	6/16	7/20	15	5/16	6/20	13	5/16	6/20
50	18	6/16	7/20	16	5/16	6/20	13½	5/16	6/20
52	18½	6/16	7/20	16½	5/16	6/20	14	5/16	6/20
54	19	6/16	7/20	17	5/16	6/20	14½	5/16	6/20
56	20	6/16	7/20	18	5/16	6/20	15	5/16	6/20
58	20½	6/16	7/20	18½	5/16	6/20	15½	5/16	6/20
60	21	6/16	7/20	19	5/16	6/20	16	5/16	6/20
62	22	6/16	7/20	20	5/16	6/20	16½	5/16	6/20
64	23	6/16	7/20	21	5/16	6/20	17	5/16	6/20

TOPMASTS.—The plating should be of the thickness given in the Table. The seams of topmasts may be single riveted; the butts should be treble riveted, and their straps $\frac{1}{16}$ of an inch thicker in iron topmasts, and $\frac{1}{20}$ thicker in steel than the plates they connect. There should be doubling plates in the way of the lower mast cap. Topmasts should be efficiently strengthened in the way of the fid holes, and in the way of sheave holes where such are cut, by the doubling plates, iron hoops, or by other approved methods.

Topmast 38 feet in length and under 46 feet, to have two stiffening angles $3'' \times 2\frac{1}{2}'' \times \frac{6}{16}''$ fitted as nearly as practicable at the fore and after parts of the mast.

Where the length is 46 feet and under 66 feet, the angles to be $3\frac{1}{2}'' \times 3\frac{1}{2}'' \times \frac{6}{16}''$.

When the length of the topmasts exceeds 46 feet, efficient cheek plates are to be fitted to the same.

The diameter of the topmasts at the lower cap, sheave hole, and topmast cap, to be in no case less than that of the yards at these places.

LOWER YARDS.—The plating should be of the thickness given in the Table. The seams of yards may be single riveted; their butts should be treble riveted, and connected by being overlapped, or by efficient butt straps. The plates should be doubled at the centre, and the doubling plates should extend beyond the truss hoops.

Where iron or steel masts and yards are to be constructed otherwise than in accordance with the Tables, plans and particulars of the same must be submitted for the approval of the Committee.

Where Steamers are intended to be fitted with topmasts for auxiliary purposes, they might be one-eighth less in diameter than prescribed by Table.

London, E.C.—14th December, 1893.

REGISTER TONNAGE UNDER DECK.	Tons. 3000 AND UNDER 3500		Tons. 2600 AND UNDER 3000		Tons. 2300 AND UNDER 2600		Tons. 2000 AND UNDER 2300		Tons. 1800 AND UNDER 2000		Tons. 1600 AND UNDER 1800		Tons. 1400 AND UNDI 1600	
PLATING NUMBER.	32000 AND UNDER 36000		29000 AND UNDER 32000		26600 AND UNDER 29000		24200 AND UNDER 26600		22500 AND UNDER 24200		20700 AND UNDER 22500		18800 AND UNDI 20700	
	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size inch
Fore & Main Shrouds ...	6 and 2 cap	$5\frac{1}{2}$	6 and 2 cap	$5\frac{1}{4}$	6 and cap	5	6 and cap	$4\frac{7}{8}$	6 and cap	$4\frac{3}{4}$	6 and cap	$4\frac{1}{2}$	6 and cap	4
,, ,, Chain plates ...		$2\frac{3}{4}$		$2\frac{5}{8}$		$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$		$2\frac{1}{8}$		2
,, ,, Dead-eyes ...		—	—		—		—		12 × 7		$11\frac{1}{2} \times 6\frac{1}{2}$		11 ×	
,, ,, Lanyards (hemp)		—	—		—		—		6		$5\frac{3}{4}$		5	
,, ,, {Rigging Screws Diameter at bottom of thread}		$2\frac{1}{4}$		$2\frac{1}{8}$		2		$1\frac{7}{8}$		$1\frac{7}{8}$		$1\frac{3}{4}$		1
,, ,, {Rigging Screws Diameter of Pins}		2		$1\frac{7}{8}$		$1\frac{3}{4}$		$1\frac{5}{8}$		$1\frac{5}{8}$		$1\frac{1}{2}$		1
,, ,, Topmst. bckstys.	3	$5\frac{1}{2}$	3	$5\frac{1}{4}$	3	5	3	$4\frac{7}{8}$	3	$4\frac{3}{4}$	3	$4\frac{1}{2}$	3	4
,, ,, Top-gllt. bckstys.	2	$4\frac{1}{4}$	2	$4\frac{1}{8}$	2	$3\frac{7}{8}$	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$	2	$3\frac{1}{4}$	2	3
,, ,, Lower stays ...	2	$5\frac{1}{2}$	2	$5\frac{1}{4}$	2	5	2	$4\frac{7}{8}$	2	$4\frac{3}{4}$	2	$4\frac{1}{2}$	2	4
,, ,, Top-mast stays...	2	$5\frac{1}{2}$	2	$5\frac{1}{4}$	2	5	2	$4\frac{7}{8}$	2	$4\frac{3}{4}$	2	$4\frac{1}{2}$	2	4
,, ,, Top-gallant stays		$4\frac{1}{4}$		$4\frac{1}{8}$		$3\frac{7}{8}$		$3\frac{3}{4}$		$3\frac{1}{2}$		$3\frac{1}{4}$		3
Mizen Shrouds	5 and cap	$4\frac{1}{2}$	5 and cap	$4\frac{3}{8}$	5 and cap	$4\frac{1}{4}$	5 and cap	$4\frac{1}{8}$	5 and cap	4	5 and cap	$3\frac{3}{4}$	5 and cap	3
,, Topmast backstays ...	3	$4\frac{1}{2}$	3	$4\frac{3}{8}$	3	$4\frac{1}{4}$	3	$4\frac{1}{8}$	3	4	3	$3\frac{3}{4}$	3	3
,, Top-gallant backstays ...	2	$3\frac{1}{4}$	2	$3\frac{1}{8}$	2	3	2	$2\frac{7}{8}$	2	$2\frac{3}{4}$	2	$2\frac{1}{2}$	2	2
,, Lower stays	2	$4\frac{1}{2}$	2	$4\frac{3}{8}$	2	$4\frac{1}{4}$	2	$4\frac{1}{8}$	2	4	2	$3\frac{3}{4}$	2	3
,, Topmast stays	2	$4\frac{1}{2}$	2	$4\frac{3}{8}$	2	$4\frac{1}{4}$	2	$4\frac{1}{8}$	2	4	2	$3\frac{3}{4}$	2	3
,, Top-gallant stays ...		$3\frac{1}{4}$		$3\frac{1}{8}$		3		$2\frac{7}{8}$		$2\frac{3}{4}$		$2\frac{1}{2}$		2
Bobstay Bar		$4\frac{1}{8}$		$4\frac{1}{8}$		4		$3\frac{7}{8}$		$3\frac{3}{4}$		$3\frac{5}{8}$		3
,, Pin		$3\frac{1}{8}$		$3\frac{1}{8}$		3		$2\frac{7}{8}$		$2\frac{3}{4}$		$2\frac{5}{8}$		2
,, Chain		$2\frac{1}{16}$		$2\frac{1}{16}$		2		$1\frac{15}{16}$		$1\frac{14}{16}$		$1\frac{13}{16}$		1
Bowsprit Shrouds (Chain) ...	2	$1\frac{1}{8}$	2	$1\frac{1}{8}$	2	$1\frac{1}{16}$	2	$1\frac{1}{16}$	2	1	2	1	2	

1.—The above requirements are intended to apply to vessels in which the dimensions of the masts and yards ar such as would not be deemed unusual for vessels of the respective tonnages; where these dimensions are extreme, o in other exceptional cases where deviations from the above sizes are required, rigging plans showing the sizes an arrangements of the several parts should be submitted for the approval of the Committee.

2.—Where four masts are adopted instead of three, the tonnage of the vessel may be reduced one-fifth, an where five masts are adopted, one fourth, in obtaining the sizes of Rigging, &c., from the above table.

3.—Where pole masts are adopted in vessels requiring one cap shroud only, an additional cap shroud is to b fitted, when the number of lower shrouds may be correspondingly reduced.

4.—Where double top-gallant yards are to be adopted, a topmast cap backstay should be fitted in addition.

TABLE II.

Tons. 1200 AND UNDER 1400		Tons. 1000 AND UNDER 1200		Tons. 800 AND UNDER 1000		Tons. 700 AND UNDER 800		Tons. 600 AND UNDER 700		Tons. 500 AND UNDER 600		Tons. 400 AND UNDER 500		Tons. 300 AND UNDER 400	
16800 AND UNDER 18800		14800 AND UNDER 16800		12700 AND UNDER 14800		11600 AND UNDER 12700		10300 AND UNDER 11600		9000 AND UNDER 10300		7700 AND UNDER 9000		6100 AND UNDER 7700	
No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.
6 and cap	$4\frac{1}{8}$	6 and cap	4	5 and cap	$3\frac{3}{4}$	5 and cap	$3\frac{1}{2}$	5 and cap	$3\frac{1}{4}$	5	3	4	$2\frac{3}{4}$	4	$2\frac{1}{2}$
	$1\frac{7}{8}$		$1\frac{7}{8}$		$1\frac{3}{4}$		$1\frac{3}{4}$		$1\frac{5}{8}$		$1\frac{3}{8}$		$1\frac{1}{4}$		$1\frac{1}{4}$
$10\frac{1}{2} \times 6$		10×6		$9\frac{1}{2} \times 5\frac{1}{2}$		$9 \times 5\frac{1}{2}$		$8\frac{1}{2} \times 5$		8×5		$7\frac{1}{2} \times 4\frac{1}{2}$		$7 \times 4\frac{1}{2}$	
	$5\frac{1}{4}$		5		$4\frac{3}{4}$		$4\frac{1}{2}$		$4\frac{1}{4}$		4		$3\frac{3}{4}$		$3\frac{1}{2}$
	$1\frac{5}{8}$		$1\frac{5}{8}$		$1\frac{1}{2}$		$1\frac{1}{2}$		$1\frac{3}{8}$		$1\frac{1}{4}$		$1\frac{1}{8}$		$1\frac{1}{8}$
	$1\frac{3}{8}$		$1\frac{3}{8}$		$1\frac{3}{8}$		$1\frac{3}{8}$		$1\frac{1}{4}$		$1\frac{1}{8}$		1		1
3	$4\frac{1}{8}$	3	4	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$	2	$3\frac{1}{4}$	2	3	2	$2\frac{3}{4}$	2	$2\frac{1}{2}$
2	$2\frac{3}{4}$	2	$2\frac{5}{8}$	2	$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$		$2\frac{1}{8}$		2		$1\frac{3}{4}$
2	$4\frac{1}{8}$	2	4	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$	2	$3\frac{1}{4}$	2	3	2	$2\frac{3}{4}$	2	$2\frac{1}{2}$
2	$4\frac{1}{8}$	2	4	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$		$3\frac{1}{4}$		3		$2\frac{3}{4}$		$2\frac{1}{2}$
	$2\frac{3}{4}$		$2\frac{5}{8}$		$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$		$2\frac{1}{8}$		2		$1\frac{3}{4}$
5 and cap	$3\frac{1}{4}$	5	3	5	$2\frac{7}{8}$	5	$2\frac{3}{4}$	4	$2\frac{5}{8}$	4	$2\frac{1}{2}$	3	$2\frac{3}{8}$	3	$2\frac{1}{4}$
3	$3\frac{1}{4}$	3	3	2	$2\frac{7}{8}$	2	$2\frac{3}{4}$	2	$2\frac{5}{8}$		$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$
2	$2\frac{1}{8}$	2	2		$1\frac{7}{8}$		$1\frac{3}{4}$		$1\frac{5}{8}$		$1\frac{1}{2}$		$1\frac{3}{8}$		$1\frac{1}{4}$
2	$3\frac{1}{4}$	2	3		$2\frac{7}{8}$		$2\frac{3}{4}$		$2\frac{5}{8}$		$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$
2	$3\frac{1}{4}$		3		$2\frac{7}{8}$		$2\frac{3}{4}$		$2\frac{5}{8}$		$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$
	$2\frac{1}{8}$		2		$1\frac{7}{8}$		$1\frac{3}{4}$		$1\frac{5}{8}$		$1\frac{1}{2}$		$1\frac{3}{8}$		$1\frac{1}{4}$
	$3\frac{1}{4}$		3		$2\frac{1}{2}$		$2\frac{1}{4}$		2		2		2		2
	$2\frac{1}{4}$		$2\frac{1}{8}$		$1\frac{7}{8}$		$1\frac{5}{8}$		$1\frac{1}{2}$		$1\frac{1}{2}$		$1\frac{1}{2}$		$1\frac{1}{2}$
	$1\frac{10}{16}$		$1\frac{8}{16}$		$1\frac{6}{16}$		$1\frac{5}{16}$		$1\frac{4}{16}$		$1\frac{4}{16}$		$1\frac{4}{16}$		$1\frac{3}{16}$
2	$\frac{7}{8}$	2	$\frac{13}{16}$	2	$\frac{12}{16}$		$\frac{12}{16}$		$\frac{11}{16}$		$\frac{10}{16}$		$\frac{9}{16}$		$\frac{9}{16}$

STEEL WIRE STANDING RIGGING.			
SIZE.	BREAKING TEST.	SIZE.	BREAKING TEST.
Inches.	Tons.	Inches.	Tons.
$5\frac{1}{2}$	58	$3\frac{1}{8}$	$17\frac{1}{2}$
$5\frac{1}{4}$	53	3	16
5	48	$2\frac{7}{8}$	$14\frac{1}{2}$
$4\frac{7}{8}$	44	$2\frac{3}{4}$	13
$4\frac{3}{4}$	42	$2\frac{5}{8}$	12
$4\frac{5}{8}$	40	$2\frac{1}{2}$	11
$4\frac{1}{2}$	38	$2\frac{3}{8}$	10
$4\frac{3}{8}$	36	$2\frac{1}{4}$	9
$4\frac{1}{4}$	34	$2\frac{1}{8}$	8
$4\frac{1}{8}$	32	2	7
4	30	$1\frac{7}{8}$	6
$3\frac{7}{8}$	28	$1\frac{3}{4}$	$5\frac{1}{2}$
$3\frac{3}{4}$	26	$1\frac{5}{8}$	5
$3\frac{5}{8}$	24	$1\frac{1}{2}$	4
$3\frac{1}{2}$	22	$1\frac{3}{8}$	$3\frac{1}{4}$
$3\frac{3}{8}$	$20\frac{1}{2}$	$1\frac{1}{4}$	3
$3\frac{1}{4}$	19		

5.—The steel wire ropes to be guaranteed to withstand the breaking stress given in the table, and no hemp is to be used in the strands, a hemp core only to be fitted.

6.—A short length of each of the wires composing the rigging will be required, after being galvanized, to withstand a tensile stress equivalent to that set forth in the Table, and the aggregate strength of the wires must not be less than 10 per cent. in excess of that stress.

7.—Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

8.—Where it is proposed to adopt iron wire rigging the sizes proposed and the guaranteed tests should be submitted for the consideration of the Committee.

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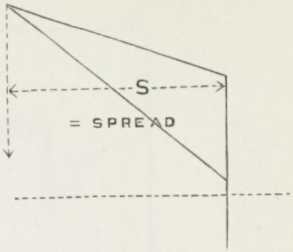
ANCHOR CRANES.



The dimensions of the principal parts of ANCHOR CRANES to be in accordance with the following Table :—

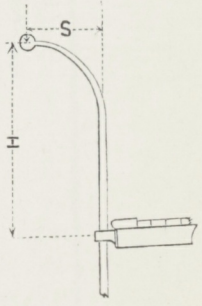
WEIGHT OF ANCHOR INCLUDING STOCK.	SPREAD OF CRANE IN FEET.						
	9	10	11	12	13	14	15
Cwts.	DIAMETER OF MAIN POST AT DECK IN INCHES.						
20	6	6¼	6½	6¾	6¾	7	7¼
25	6½	6¾	7	7¼	7¼	7½	7¾
30	7	7¼	7½	7¾	7¾	8	8¼
35	7¼	7½	7¾	8	8	8¼	8½
40	7½	7¾	8	8¼	8½	8¾	9
45	8	8¼	8½	8¾	9	9¼	9½
50	8¼	8½	8¾	9	9¼	9½	9¾
55	8½	8¾	9	9¼	9½	9¾	10
60	8¾	9	9¼	9½	9¾	10	10¼

CORRESPONDING DIMENSIONS OF MAIN POST, TIE RODS AND JIBS.

	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Diameter of Main Post at deck	6	6½	7	7½	8	8½	9	9½	10	10½
Tie Rod	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞
Jib (Diameter at middle) ...	3	3¼	3½	3¾	4	4¼	4½	4¾	5	5¼

If two Tie rods are fitted, the diameter of each to be ¾th that of the single rod required.

BOATS' DAVITS.



In the cases of Boats and Davits of ordinary proportions the diameter of the davits in inches should be one-fifth of the length of the boats in feet, but in cases where the height and spread of the davits or the dimensions of the boats are not of ordinary proportions, the diameter of the davits in inches should be found from the formula :—

$$\sqrt[3]{\frac{L \times B \times D}{40}\left(\frac{H}{3} + S\right)}$$

where L, B and D are the dimensions of the boat, H the height of the davit above its uppermost point of support, and S the spread of the davit, each of these dimensions being in feet.

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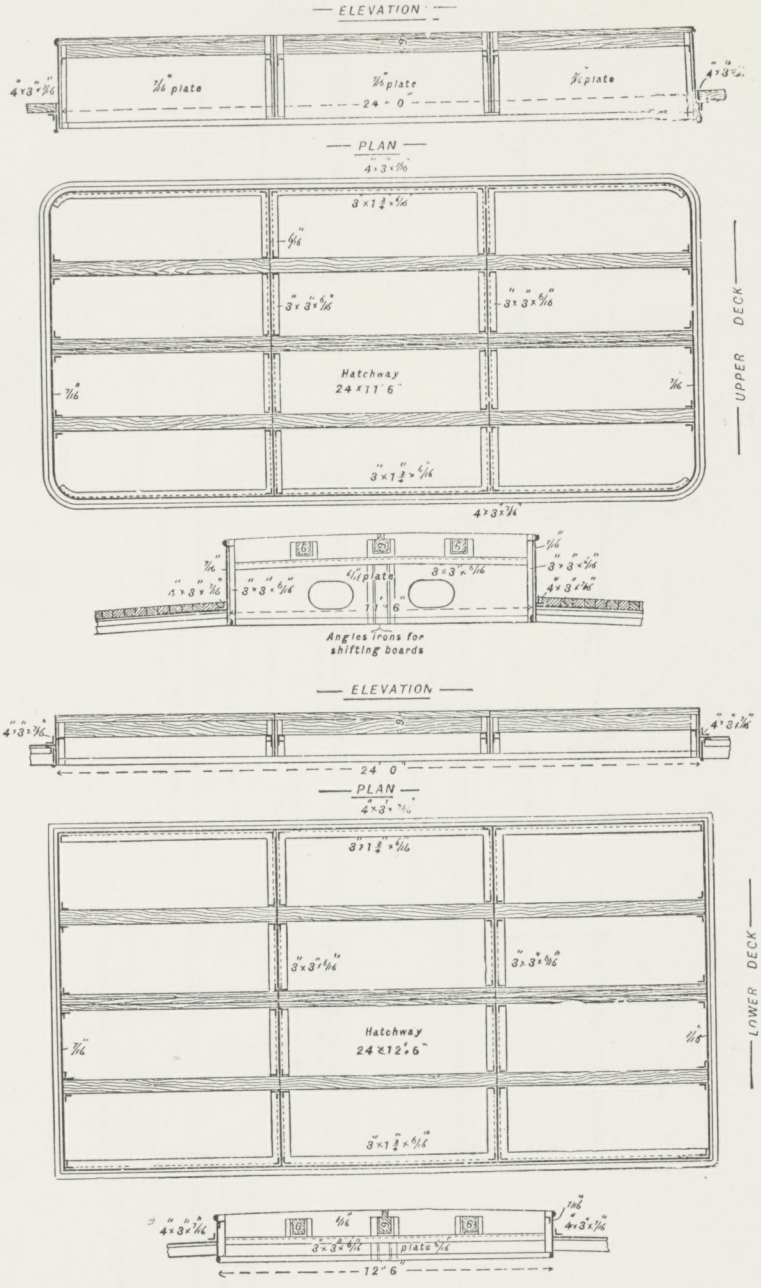


Sketch showing arrangement of Shifting Beams in Cargo Hatchways.

FIG. 1.

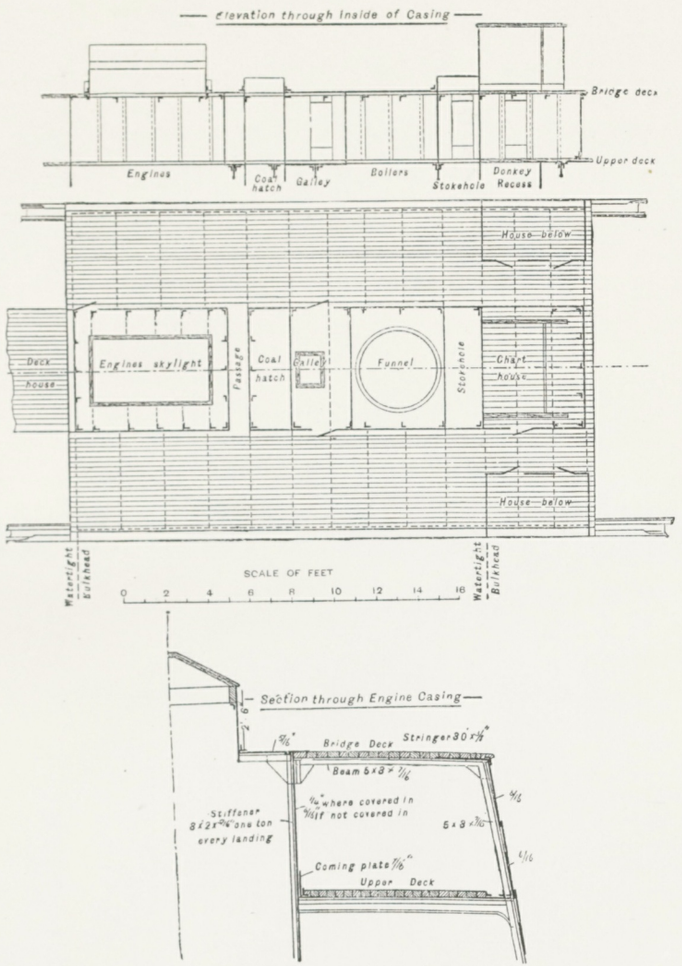


FIG. 2.

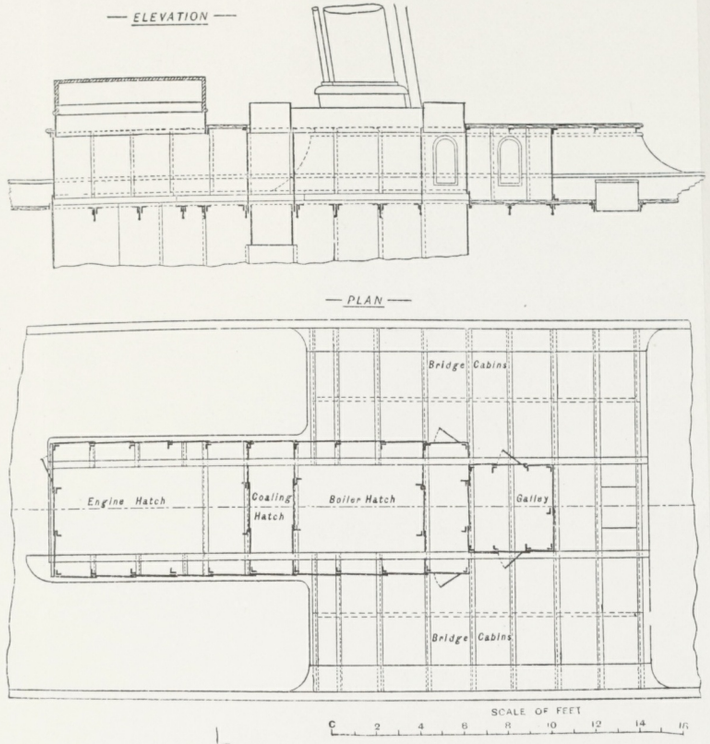


FIG 3.

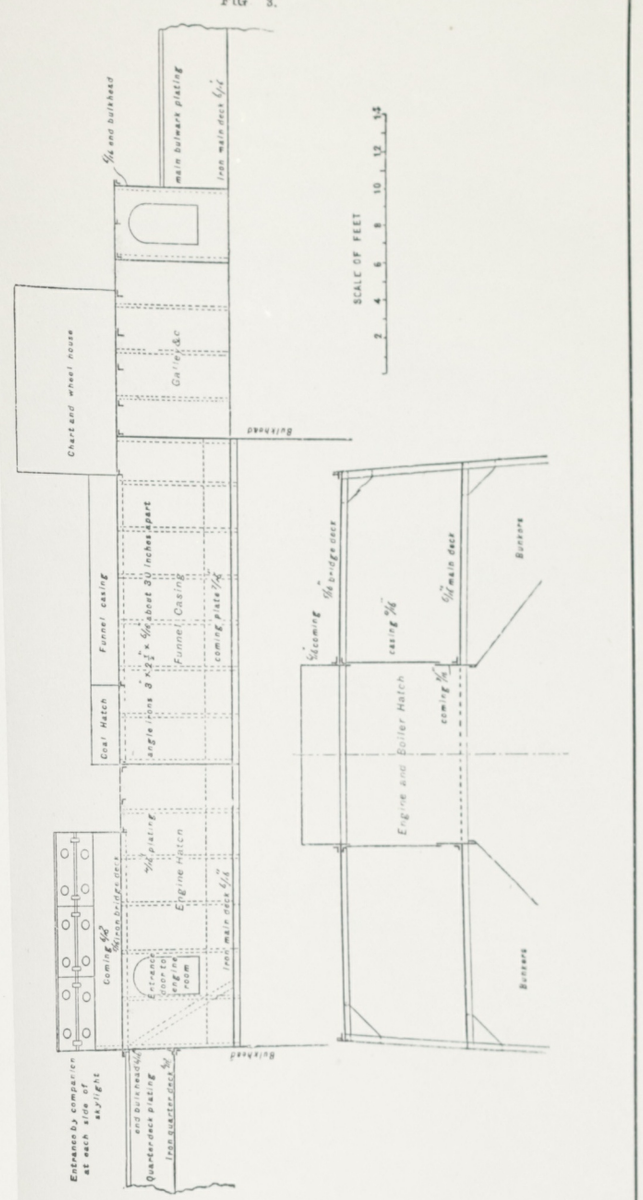
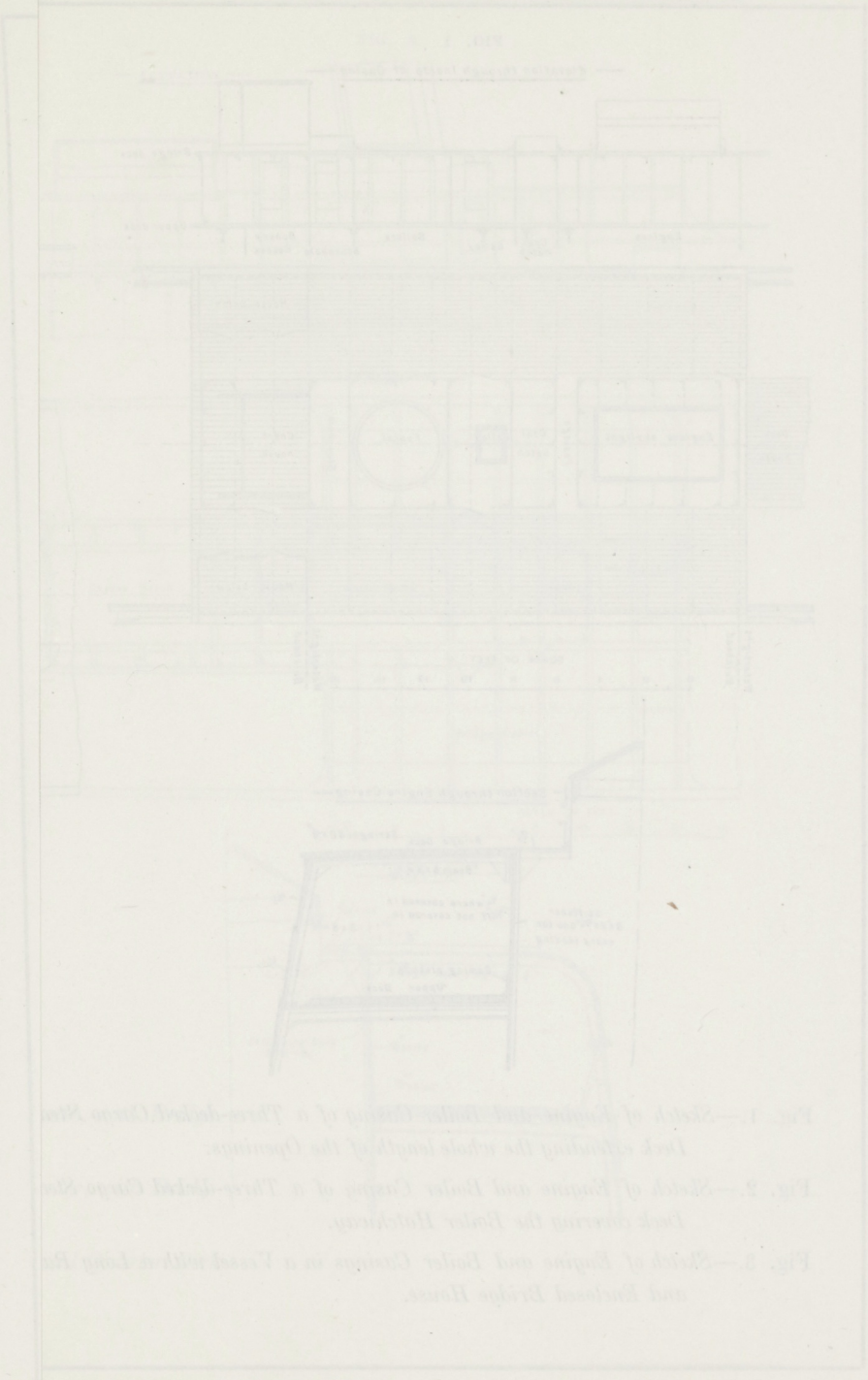


Fig. 1.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck extending the whole length of the Openings.*

Fig. 2.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck covering the Boiler Hatchway.*

Fig. 3.—*Sketch of Engine and Boiler Casings in a Vessel with a Long Raised Quarter Deck and Enclosed Bridge House.*



LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES FOR STEEL VESSELS.

1894—95.

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RULES

FOR

THE BUILDING AND CLASSIFICATION OF STEEL VESSELS.

1. **Steel Vessels** will be classed A with a Numeral prefixed, so long as, on careful annual and periodical Special Surveys, they are found to be in a fit and efficient condition for the safe conveyance of dry and perishable cargoes. (*See* N.B. at foot.)

2. 100A, and 90A, will denote vessels that have been built in accordance with, or equal to, the Rules, and Tables S 1 to S 8. Deviations from the Rules will be allowed, provided that a sketch of the mid-ship section, plans, &c., in each case, showing the proposed scantlings and arrangements, be first submitted through the resident Surveyors, and approved by the Committee; and, that the vessels be built in accordance with the approved plans, under the survey of the Surveyors of this Society.*

3. Vessels which do not fulfil all the requirements for the 100A class, but which are superior to those built on the 90A scale, may, if the Committee approve, be classed 95A.

4. At the time of any survey, the comparative numeral will depend on the thickness of the plating and angles, and the general condition of the vessel.†

5. In the cases of vessels intended to load or discharge on the ground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which under the circumstances they will be subjected.

6. Vessels which are built for special purposes, and which are considered fit for such purposes, may be classed A, provided all the details of the scantlings and arrangements be submitted to the Committee for approval.

7. To the class A in such cases will be affixed a designation, showing the particular trade or purpose for which the vessels are intended, thus:—A "For River purposes only." A "For Tug purposes." A "Fishing Smack." A "For Channel purposes," &c.

8. In vessels intended for Channel purposes, the particular Channel is to be defined thus: "Bristol Channel," "Irish Channel," "English Channel," "Newhaven—Dieppe," &c.; and all vessels classed for Channel purposes must have a minimum freeboard, as required in awning-decked vessels, to be submitted for the approval of the Committee.

N.B.—It is to be distinctly understood that the numerals prefixed to the letter A *do not signify terms of years, but are intended for the purpose of comparison only; the* A *character assigned being for an indefinite period, subject to annual and periodical Survey as hereinafter described.*

* In vessels building, or to be built, under contract for classification, deviations from the Rules will not be allowed by the Committee, unless the Builder shall previously obtain the sanction of the Owner.

† *Expunging or withdrawal of character.—The fifth, sixth, and seventh Columns in the list of Steam Vessels, and the sixth, seventh, and eighth Columns in the list of Sailing Vessels, left blank, indicate that the Vessel has never been Classed in the Register Book. Three dots . . . in Column 7 in the list of Steam Vessels, and Column 8 in the list of Sailing Vessels indicate that the vessel was at one time Classed by this Society, but that the Class has been withdrawn at Owners' request. A black line with date under it in Column 5 in the list of Steam Vessels, and Column 6 in the list of Sailing Vessels, indicates that, at that date, the Vessel,* from reported defects, *was not entitled to a Character in the Register Book. A red line with date under it in these Columns indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.*

9. To entitle vessels classed A "For Channel Purposes" to the Figure 1, the equipment of Anchors and Chain Cables, &c., should be as required by Table 22, with the exception that not more than two bower anchors need be supplied, the first bower being of the greatest weight given in the table, and the second bower 15 per cent. lighter, the stream anchor only being required.

10. In vessels, however, engaged for more extended voyages, such as the Queenboro' and Flushing service, or the Channel Islands or Irish Sea, the equipment must be in accordance with the requirements of Table 22.

11. To entitle STEEL VESSELS to retain the Characters assigned to them in the Register Book, they are required to be subjected to the following Special Surveys, designated No. 1, No. 2, and No. 3, respectively.

12. The periods at which these surveys are intended to be held, in the case of vessels classed from 100A to 90A inclusive, are when a vessel is 4 years, 8 years, and 12 years old respectively, and at like periods from the date when the No. 3 Survey was held.*

13. In every case the date of build of a vessel is to be reckoned from the last date of the survey for first entry of classification, when such survey is completed within six months of the date of launching: but when the first entry survey is not completed within that period then the date of build will be reckoned from six months after the date of launching. The date when the special periodical surveys respectively become due is to be calculated from the date of build, as above described, or the last date of the No. 3 Survey.

14. Similarly, vessels classed A for special purposes must be subjected to a special survey every *three* years, as per Nos. 1, 2, and 3, and afterwards as per Nos. 1, 2, and 3, consecutively.

15. In any case in which it may suit the convenience of the Owners, the special surveys Nos. 1 and 2 may be held at any time within twelve months previous to the expiration of the period when they severally become due, and the special survey No. 3 may be held at any time before the date when it becomes due.

16. To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due.

17. When a special survey is only partially held, the Surveyors must give the Owners or their Agents written notice of the parts not surveyed, and also report the facts to the Committee.

18. If a vessel is at a port in the United Kingdom after the expiration of the prescribed period for survey, and is not subjected to the special survey then due before leaving the United Kingdom, the word "*Expired*" will be inserted against her character in the Register Book; and in no case will a vessel be allowed to retain her class if she has not been subjected to the whole of the requirements of the requisite special survey within twelve months from the date when the survey became due.

N.B.—In order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage or from other causes, rests with the Owners, Masters, or Agents.*

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the Subsequent Special Surveys may be Nos. 1, 2 and 3, consecutively, dating from the completion of such No. 3 Survey.

19. Vessels which have undergone either of the foregoing examinations will be noted in the Register Book, thus :—*ss*No. 1–91, *ss*No. 2–91, *ss*No. 3–9,91, indicating the special survey and date thereof.

20. At each of these Special Surveys of Steam Vessels, the machinery and boilers—unless they have been specially surveyed within a period of twelve months—are to be examined, as to their safety and efficiency, by the Engineer-Surveyors and reported upon to the Committee. *See* pages 86 and 145.

21. Whenever the engines or boilers are taken out, the bearers, with the floor-plates, keelsons, rivets, &c., under them, are to be surveyed; and whenever the bottom plating is to be cemented a survey is to be held prior to the cement being laid.

*Survey No. 1.

1. The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway, proper stages to be made and the holds and peaks to be cleared; the limber boards and ceiling equal to not less than two strakes fore and aft on each side removed, one of which is to be taken from the bilges. Where the ceiling in the flat of bottom is fitted in hatches, the whole of the hatches and one strake of ceiling at the bilges are to be removed,† and both surfaces of outside plating exposed,‡ and cleaned and coated where necessary.

2. The coal bunkers to be cleared for examination, and ceiling removed as in the holds.

3. In all vessels the masts, spars, and general equipment must be in good and efficient condition.

4. If the vessel has a double bottom, the ceiling must be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

5. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

6. Note.—*At the Special Survey No.* 1 *succeeding No.* 3, *the chain cables are to be ranged for inspection.* When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch according to their size, they are to be renewed.

7. In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors.

8. The steam steering engine and its connections to be examined.

9. For periodical Surveys of Engines and boilers, *see* page 83, paragraph 20, and page 145.

*Survey No. 2.

1. The vessel to be placed on block of sufficient height in a dry dock or on a slipway, proper stages to be made and the holds and peaks to be cleared; the limber boards and ceiling not less than *three* strakes fore and aft on each side removed, one of which is to be taken from the bilges. Where the ceiling in the flat of bottom is fitted in hatches, the whole of the hatches and one strake of ceiling at the bilges are to be removed,† and both surfaces of outside plating exposed,‡ and cleaned and coated where necessary.

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

‡ In cases where the inner surface of the bottom plating is coated with cement, or asphalt, if the coating be carefully inspected and tested, by beating or chipping, and found sound and adhering satisfactorily to the steel its removal may be dispensed with.

2. The coal bunkers to be cleared for examination, and ceiling removed as in the holds.

3. The windlass at this and all subsequent alternate special surveys to be unhung, where necessary, and its wood linings sufficiently stripped, for examination. The chain cables are also to be ranged for inspection at this and all subsequent special surveys. When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch according to their size, they are to be renewed.

4. In all vessels the masts, spars, and general equipment must be in good and efficient condition.

5. If the vessel has a double bottom, the ceiling must be removed therefrom, and the efficiency of the tanks be tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

6. After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No. 2, when that survey becomes due, ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the vessel.

7. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

8. The steam steering engine and its connections to be examined.

9. In Steam Vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* page 83, paragraph 20, and page 145.

*Survey No. 3.

1. To be held by two Surveyors, one to be an officer of the Society.—The vessel to be placed on blocks of sufficient height in a dry dock or on a slipway ; proper stages to be made and the holds and peaks to be cleared ; all the close ceiling to be removed, so that the rivets, plates of keel, and flat of bottom may be thoroughly examined ; coal-bunkers of steam-vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets and inner surface of the plating to be exposed, and where side lights are fitted, the condition of the plating in way of the same to be ascertained. All oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder ; the planksheers and waterways, if of wood, to be scraped bright. When the vessel is thus prepared, the Surveyors are to ascertain the thickness of the plating by having holes drilled in such parts as may be deemed necessary,† and to furnish a detailed statement of the thicknesses in their report.

2. Such parts as may be found defective, or materially less than the required substance by Rule, are to be removed and replaced with proper materials, equal in substance and quality to the original construction.‡

* To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months from the date when the survey became due. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

† In cases where the inner surface of the bottom plating is coated with cement, or asphalt, if the coating be carefully inspected and tested by beating or chipping and found sound, and adhering satisfactorily to the steel, its removal may be dispensed with.

‡ Where the deterioration in thickness is widespread, and it is not deemed advisable by the Owner to renew the material, on a detailed report being made by the resident Surveyor, the class of the vessel will be reconsidered.

The planksheers, waterways, flat of decks and their fastenings, are also to be examined and made good where necessary.

3. In all vessels the masts, spars, and general equipment must be in a good and efficient condition All mast and bowsprit wedging at this and subsequent Special Surveys to be removed, unless the plating of iron or steel masts and bowsprits is doubled in way of the same, when it will only be necessary to remove the wedging at the Special Surveys, No. 3. Iron or steel masts, bowsprits, and yards to be carefully tested by hammering and if the plates are considered by the Surveyors to be materially wasted at any part, the thickness is to be ascertained by drilling.

NOTE.—*The masts and spars are to be subject to examination by the Surveyors when deemed necessary by them on other occasions besides Special Surveys.*

4. If the vessel has a double bottom, the ceiling must be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where deep water ballast tanks are fitted, their water-tightness to be tested by a head of water not less than 8 feet above the crown of the tank.

5. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

6. The chain cables are to be ranged for inspection. When chain cables are worn from $\frac{2}{16}$ to $\frac{4}{16}$ of an inch, according to their size, they are to be renewed.

7. The steam steering engine and its connections to be examined.

8. In steam vessels the engines and boilers must be examined and favourably reported on by the Society's Engineer-Surveyors. *See* page 83, paragraph 20, and page 145.

Second Special Survey No. 3.

1. The vessel must be submitted to the same survey as before described for *Survey No. 3*, with the following additions:—

2. The condition of the scantlings must be ascertained, the shell plating to be drilled at such parts as the Surveyors may consider necessary to satisfy themselves as to its thickness, the number of holes on each side in no case being less than the number of strakes of plating not covered with cement in the vessel.

3. Care should be taken especially to ascertain the extent of deterioration of steamers in way of the side bunkers and boilers.

4. A sketch showing the thickness at the parts where drilled is to accompany the report on the vessel, for the consideration of the Committee.

5. The plating in way of cement in the bottom need not be drilled, provided the cement be found to be adhering satisfactorily to the plating, and the Surveyors consider drilling unnecessary.

SURVEYS WHILE BUILDING.

1. The Surveyors are to examine during the progress of a vessel, the materials and workmanship, from the laying of the keel to her completion; and to point out as early as possible anything that may be objectionable.

SURVEY OF MACHINERY.

1. In steam vessels the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam. Machinery certificates will be granted, and notifications thereof made in the Register Book, thus: "LMC 9,91" *in red* (*i.e.* LLOYD'S MACHINERY CERTIFICATE, September, 1891). (*See* Section 39.)

2. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠LMC," or "✠NE&B," or "✠NB"

3. For requirements relating to the Survey and construction of engines and boilers, *see* Section 47, pages 134 to 145.

RULES FOR THE BUILDING OF STEEL VESSELS.

Section 1. 1. In all cases where it is proposed to build ships of steel for classification in the Register Book, a sketch of midship section with longitudinal, deck, and other plans showing the details of the scantlings and arrangements, must in the first place be submitted for the approval of the Surveyors, and in all cases where deviations from the rules are proposed they must be submitted for the approval of the Committee, and the vessel must be built under special survey to the plans approved and otherwise in accordance with the following Rules, subject to such modifications as may be deemed necessary by the Committee.*

2. The scantlings given in Tables S 1, S 2, and S 3, are intended for vessels the length of which does not exceed *eleven times* their depth from the top of keel. Where this proportion is exceeded *see* Sec. 46 and Table S 6.

3. For proportions of breadth to length see Table S 5.

4. The measurements for regulating the scantling numbers and proportions are to be taken as follows :—

LENGTH.

5. The length to be measured from the after part of the stem to the fore part of the stern-post on the range of the upper deck beams in one, two, and three decked and spar-decked vessels, but on the range of main deck beams in awning-decked vessels.

6. In vessels where the stem forms a cutwater the length is to be measured from the place where the upper deck beam line would intersect the after edge of stem if it were produced in the same direction as the part below the cutwater.

BREADTH.

7. The breadth is in all cases to be the greatest moulded breadth of the vessel.

DEPTH.

8. The depth in one and two-decked vessels is to be taken from the upper part of the keel to the top of the upper deck beam at the middle of the length, assuming a normal round up of beam of one quarter of an inch to a foot of breadth. In Spar-decked vessels and Awning-decked vessels the depth is to be taken from the upper part of the keel to the top of the main deck beam at the middle of the length, with the above normal round up of beam. For "Three-deck" steam vessels *see* Section 41.

* The rivets, keel, stem, stern-frame, rudder and pillars may be of iron of the sizes given by the rules for steel vessels; also the floors, girders, and top plating of double bottoms, coal bunker, and other bulkheads, shaft tunnels, casings round engines, hatchway coamings, poops forecastles, bulwarks and deck erections may be of iron of the size required by the rules for iron vessels. All liners may be of iron, but no other parts of such ships are to be of iron without the special sanction of the Committee.

SCANTLINGS.

Section 2. 1. The scantlings and spacing of the frames, reversed frames, and floor-plates, the thickness of bulkheads and the diameter of pillars in Table S 1 are regulated by numbers, which are produced as follows :—

2. For one and two-decked vessels.—The number is the sum of the measurements in feet arising from the addition of the half-moulded breadth of the vessel at the middle of the length, the depth from the upper part of the keel to the top of the upper deck beams, with the normal round-up, and the girth of the half midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate.

3. For "Three-deck" steam vessels.—The number is produced by the deduction of 7 feet from the sum of the measurements taken to the top of the upper deck beams. (*See* Section 41.)

4. For Spar-decked vessels and Awning-decked steam vessels.—The number is the sum of the measurements in feet taken to the top of the main deck beams, as described for vessels having one or two decks.

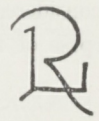
5. The scantlings of the keel, stem, stern-frame, keelson and stringer plates, the thickness of the outside plating and deck ; also the scantlings of the angle bars on beam stringer plates, and keelson and stringer angles in hold, as in Tables S 2, S 3, and S 5, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

6. In vessels of exceptional fineness of form, intended for passenger traffic, or to carry a limited amount of cargo with a fixed freeboard, a modification in the scantlings will be admitted, subject to all particulars being submitted by the Builders, and the deviations from the scantlings required by the rules being sanctioned by the Owner.

QUALITY OF STEEL.

Section 3. 1. The steel will be required to withstand the whole of the following tests, to be applied at the Steel Works under the personal inspection of the Society's Surveyors, to samples selected by them from every charge or cast employed in the manufacture of the material, and these samples when marked by them for testing, should be followed by the Surveyors through the different stages of preparation until the tests are completed.

2. The Committee will require that every plate, beam, and angle supplied for these ships shall be clearly and distinctly stamped by the Manufacturer in two places where the brand cannot be conveniently sheared off, after they have been tested, the brand to be similar to the following, thus :—



denoting that a shearing from the plate or angle so marked has successfully been bent cold after being tempered as described in the temper test which follows, and that the plate or angle in question is capable of withstanding the *whole* of the tests hereafter described ; and the Committee will require the Surveyors, when in constant attendance at the Steel Works, to satisfy themselves, so far as may be practicable, that these conditions are being complied with in a *bonâ fide* manner.

3. All plates, beams, and angles to be legibly stamped in two places with the manufacturer's name or trade mark, and the place where made, which is also to be stated in the report of survey.

4. Should the samples selected by the Surveyor not fulfil the test requirements, the plates or angles from which they were cut are to be rejected, and further tests are to be made before any material from the same charge can be accepted.

5. When one of the Society's Surveyors is not in constant attendance at the Steel Works for the purpose of seeing the material tested, the Committee will require that tensile, and temper and cold bend tests shall be applied, either at the Steel Works or at the Ship-yard, to not less than one plate, angle bars or bulb plate in every batch of 50, or a batch of less number; but the Surveyor is not to select samples for testing until the material has been tested, stamped, and appropriated by the manufacturer. The sample, when marked by the Surveyor for testing, is to be followed by him when practicable through the different stages of preparation until the tests are completed. Should the samples tested not fulfil the test requirements, the whole of the material from the charge which produced the samples which fail to withstand the tests prescribed is to be rejected, or further tests are to be applied to a sample from each of the other charges of which the batch is composed. In the event of any of these samples also failing, the whole of the material from the same charge or charges is to be rejected as in the first instance.

6. Before these sample tests have been applied to a batch of steel submitted for check testing, the Surveyor is to be furnished with a Certificate by the Manufacturer to the effect that the Society's requirements as to the testing of steel have been complied with in the case of the batch in question.

7. In the event of the material failing, in any case, to withstand the prescribed tests, the brands approved by the Committee and stamped on the plates, beams, and angles by the Manufacturer are to be defaced by punch marks extending beyond the brand in the form of a cross, thus :—

denoting that the material is rejected.

8. The Society's Surveyor will require to have every facility placed in his way for tracing all plates, beams, and angles to their respective charges, and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the tests applied to the material, he is to sign, to be forwarded by the Manufacturers to the Shipbuilders, and the other of which is to be forwarded by him to the Society's Surveyors at the port where the vessel is to be built.

STEEL SUPPLIED IN INGOTS.

9. Where steel is not produced in the steel works at which it is rolled, a Certificate is to be supplied to the Surveyor testing the material, setting forth the name of the Manufacturer who supplied it, the process of manufacture, and the numbers of the "charges," for reference to the books of the Manufacturer if considered necessary, and the number of the "charge" is to be marked on each plate or angle for the purpose of identification.

TESTS.

10. Strips cut lengthwise or crosswise of the plate, and also angle and bulb steel, to have an ultimate tensile strength of not less than 28, and not exceeding 32 tons per square inch of section, with an elongation equal to at least 20 per cent. on a length of 8 inches before fracture. Steel plates intended for garboard strakes, if specially marked for identification, may be tested to within the minimum limit allowed for boiler plates, viz., 26 tons tensile strength per square inch.

11. Steel angles intended for the framing of vessels, and bulb steel for beams, may have a maximum tensile strength of 33 tons per square inch of section, provided they be capable of withstanding the bending tests, and of being efficiently welded.

12. Strips cut from the plate, angle, or bulb steel to be heated to a low cherry-red, and cooled in water of 82° Fahrenheit, must stand bending double round a curve of which the diameter is not more than three times the thickness of the plates tested.

13. In addition to the temper tests required for *every* plate and angle, cold bend tests are to be made from each plate or bar tested for tension; also from all garboard plates, and all plates where it is known they are to be flanged.

14. In addition to this, samples of plates and bars should be subjected to cold bending tests at the discretion of the Surveyors.

RIVETS.

15. The steel used for rivets to be of special quality, soft and ductile, and samples of the rivets should be tested by being bent both hot and cold, by flattening down the heads, and by occasional forge tests, in order to satisfy the Surveyors of their thorough efficiency.

WORKMANSHIP.

Section 4. 1. The workmanship to be well executed, and submitted to the closest inspection, and amended where necessary before coating or painting: it is not, however, intended to prevent the coating of the plates inside in the way of the frames.

2. The black oxide or "millscale" *must* be removed from the surfaces before coating or painting, which should be delayed as long as possible.

3. Experience has also shown that, as regards durability, it is highly desirable to place steel vessels in dry dock within a reasonably short time after being launched, for the purpose of cleaning and re-coating the bottom.

4. Stringer plates, sheerstrakes, garboard strakes, and all buttstraps, when above $\frac{10}{20}$ of an inch in thickness, are to be carefully annealed, or the holes sufficiently rimed after punching, to remove the injurious effect of the punching.

KEEL, STEM, STERN AND PROPELLER POSTS, AND TRANSOMS.

Section 5. 1. The keel, stem, stern, and propeller posts are to be either scarphed or welded together, and to be in size according to Table S 2; if scarphed, the length of scarphs to be nine times the thickness given in the Table; and the rivet-holes required in the *thin* ends of them are to be drilled after the scarphs are fitted.

2. Where the garboard strakes are thicker than required by the Rules, the thickness of the keel may be proportionately reduced.

3. Where the keel and keelsons are made of several thicknesses of plates, their combined thickness to be the same as is required for a solid keel, as per Table S 2; and the butts of the several plates of which the keel is formed to be carefully shifted from each other.

4. When **Hollow or Flat Plate Keels** are adopted, their breadth and thickness are to be as given in Table S 2; and the strake of plating on each side adjoining the flat plate keel to be of the thickness required for the garboard strakes in the Table.

5. Where flat plate keels are used, intercostal keelson plates, or vertical centre-plates, must be fitted close down on the keel, and connected to it by double angles of the dimensions given for keelson angles in Table S 3, riveted all fore and aft to the keel and keelson. (*See also* Section 9, paragraph 6.)

6. The butt-straps of flat plate keels are to be treble riveted, and as much thicker than the plates they connect as is required for bilge strakes.

7. The stem at its lower part is to be the same moulding as the keel, and attached to it by a scarph of the same length as the keel scarph ; it may be gradually reduced from the height of the load-line to its head, where it may be three-fourths of the sectional area given in Table S 2.

8. The stern and propeller posts, and after end of keel, for single screw propelled vessels, to be of the size given in Table S 2, for stern frames, or of equal sectional area ; the portion adjoining the keel to be tapered fair into it. In a sailing vessel, or paddle steamer, the sternpost may be reduced from the lower part of the rudder trunk to its head, where it may be three-fourths of the sectional area given in the Table ; and in a steam vessel having a propeller frame, it may be reduced at the head to the size given for stems in Table S 2.

9. The portion of the forging of the stern frame forming part of the keel is to extend sufficiently forward for the after end of its scarph in sailing vessels and paddle steamers to be at least once and a half the frame space before the sternpost, and in screw-propelled vessels at least twice and a half the frame space before the propeller post.

10. The stern-post is to be extended sufficiently above the counter to be connected by two vertical angles of the frame size, to the whole depth of the transom-plate, which is to be fitted close against the stern-post. The transom-plate is to be not less than one and a half times the depth of, and the same thickness as, the midship floor-plates. In screw steamers whose plating number is 20,000 and above, the foremost or propeller post should extend sufficiently above the arch of the propeller-frame to be efficiently connected to plating on the beams, and to a deep transom-plate. (*See* Section 7, paragraph 7.)

11. The rudder braces are to be forged on the stern-post, and spaced from 4 ft. to 5 ft. 6 in.

12. When cast steel stern-frames, rudders, steering quadrants, and tillers are fitted they must be subjected to percussive, hammering, and mechanical tests, in the presence of one of the Society's Surveyors, so as to insure the material being of ductile quality. Sketches of the proposed castings are to be submitted for the approval of the Committee. Where stern-frames are in more than one piece, the length of the scarphs should not be less than three times the width of the stern-posts, and the breadth one and a half times the width of the stern-posts, secured by not less than four rows of rivets.

13. The tests to be as follows :—A tensile test is to be made on a piece taken from each casting, and the extension on a length of 8 inches is not to be less than 8 per cent., and the tensile strength not less than 28 tons, nor more than about 35 tons per square inch. A cold bending test also to be made corresponding to each tensile test, and the sample to bend cold before fracture through an angle of at least 90°.

Large stern-frames cast in one piece to be let fall on a hard flat ground (excavations being made to take the boss part and other projections), after being raised through an angle of 45°. Stern-frames cast in more than one piece, and rudders, to be dropped from a height of from 7 to 10 feet, according to the design, shape, and weight of the casting. The casting in each case to be subsequently slung up and well

hammered with a sledge hammer, not less in weight than 7 lbs., to satisfy the Surveyors that the castings are sound and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

FRAMES.

Section 6. 1. The frames to be of the dimensions set forth in Table S 1, and to extend from the keel to the gunwale. They are to fit closely to the upper edge of the keel ; and the after frames should be sufficiently apart transversely to admit of sound riveting and workmanship. At the extreme ends of the vessel the lower parts of the frames opposite to each other are to be lapped and riveted together. Where either raised quarter-decks, bridge-houses, poops, or forecastles, are constructed, the frames are to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale ; they may then terminate at the lower part of the curve.

2. When the frames are butted on the keel they are to have not less than 3 feet lengths of corresponding angle bars, fitted back to back, to cover and support the butts and receive the plating for at least three-fourths the vessel's length amidships. Similar pieces of angle bar are to be fitted if the frames are butted elsewhere.

3. The rivet holes to be punched through from the faying surfaces of the frames, and they are not to be punched at the turn of the bilge until the frames are bent to the required shape ; the holes in the way of the lands of the plating are to be drilled after the plating is wrought.

4. The spacing of the frames from centre to centre to range from 20 to 26 inches, according to the size of the vessel, which spacing should not be exceeded around the stern of the vessel at the knuckle. (*See* Table S 1.)

FLOOR-PLATES.

Section 7. 1. The floor-plates to be in size at the middle line according to Table S 1, excepting in the engine space in steam vessels, where they must be $\frac{1}{20}$ of an inch thicker, and in the boiler space $\frac{2}{20}$ of an inch thicker. Where floor plates are $\frac{9}{20}$ of an inch in thickness and above they may be reduced $\frac{1}{20}$ of an inch for one-tenth the vessel's length before and abaft the three-fifths length amidships, and the remaining floors may be $\frac{2}{20}$ of an inch less in thickness than the midship floors. They are to be moulded not less than one-half their midship depth* at a distance of three-quarters the half breadth of the vessel set out from the middle line on the run of the frame, and not less at their extreme ends than the moulding of the frames ; and they are to extend in a fair curve well up the bilges, in no case terminating lower at the outside of the frame than a perpendicular height of twice the midship depth of the floor above the top of keel. The ends of the floors to maintain the height prescribed for one quarter of the vessel's length amidships, they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level (this place to be determined by the form of the vessel), from which to the ends they are to be gradually increased in depth, so as to efficiently connect the sides ; and in the after peak of steam vessels they are to extend above the stern tube. The upper parts of the floors forward and aft are to be high enough to give ample room between the reversed frames on each side of the vessel for fitting the keelson angle bars. (*See also* Section 26, paragraph 2.)

* In vessels of unusually fine or full form the moulding should be modified to the approval of the Committee.

2. A floor-plate to be fitted and riveted to every frame, and to be extended across the middle line, except where a vertical centre-plate is adopted, in which case the floor-plates are to be efficiently connected to it on each side by double vertical angles of not less size than the reversed frames.

3. When floors are made in two lengths, the butts are to be well fitted, and to have double butt-straps treble riveted ; or, the floor-plates may be lapped and treble riveted.

4. Floor-plates to which the bulkheads are attached must be deeper than the adjacent floor-plates, to admit of the bulkheads being riveted to them above the reversed angle bars.

5. *In the cases of vessels intended to load or discharge on the ground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which under the circumstances they will be subjected.*

6. WATERCOURSES are to be formed above the frames through all the floor-plates on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre-plate, and intercostal keelsons, when such keelsons are adopted, so as to allow water to reach the pumps freely.

7. TRANSOM-PLATES are to be fitted and connected to the frames, and to the stern-post, so as to efficiently support the counter. (*See* Section 5, paragraph 10.)

REVERSED ANGLES ON FRAMES.

Section 8. 1. Reversed angles on frames to be in size as per Table S 1.

2. Vessels where the number for regulating the size of the frame is below 45, to have reversed angles riveted to every frame and floor-plate, extending across the middle line to the upper part of the bilges.

3. Vessels where the number as per Rule is 45 and below 57, to have reversed angles riveted to every frame and floor-plate, extending across the middle line to the upper part of the double angle stringer above bilges, and to the gunwale alternately ; or, if the vessel is of a depth to require hold beams, the reversed angles are to extend to the upper part of the hold beam stringer angle and gunwale alternately.

4. All vessels, except those having an awning-deck, where the number as per Rule is 57 and upwards, to have reversed angles on every frame, extending alternately to the upper deck stringer plate, and top of angle bar on stringer plate next below it. In awning-decked vessels they are all to extend to the upper part of the main deck stringer angle bar. (*See* also Section 26, paragraph 4, and Section 45, paragraph 2.)

5. In sailing vessels where the number as per Rule is 75 and upwards, the reversed frames are to extend to the gunwale on every frame.

6. Double reversed angles to be fitted on every floor, extending from bilge to bilge in the engine and boiler spaces of steam vessels ; and where the vessel is of 17 feet depth or above from the hold beams, or where the number for plating is 15,000 or above, they are to extend sufficiently high to admit of the stringer at upper part of bilge being connected to them. Short double reversed angles are also to be fitted on all frames in way of the keelsons and stringers in hold, connected by not less than three rivets to the frame.

7. The butts of reversed angles, excepting those at middle line, to be secured with butt straps, having two rivets on each side of the butt.

8. The rivets for securing the reversed angles to the frames and floor-plates to be in diameter in proportion to the greatest thickness of angle, or plate, through which they pass, as specified in Table S 1, and to be spaced seven times their diameter, from centre to centre.

9. In vessels where the plating number is 20,000 and above, reversed angles should be fitted to every frame to the height of the upper, spar, or awning deck, abaft the after peak bulkhead; and in addition, where such vessels have broad flat counters, a double angle stringer should be fitted midway between the middle, and upper, spar, or awning deck beams for a reasonable length, connected by plate knees to the transom plate; or other additional strengthening applied, as the Surveyors may deem necessary.

10. In top-gallant forecastles of vessels whose plating number is 18,000 and above, the alternate reversed frames are to extend to the forecastle deck, or a double angle stringer of the size required for reversed frames is to be fitted inside the frames midway between the upper and forecastle decks, connected at the fore end by an efficient breasthook; or other equally efficient means of strengthening the forecastle may be adopted, if approved by the Committee.

MIDDLE LINE KEELSONS.

MIDDLE LINE SINGLE PLATE KEELSON.

Section 9. 1. The middle line keelson, if of single plate and standing above the floor-plates, to be of the size prescribed in Table S 3, and to have angles of the dimensions given in the same Table fitted and riveted on its upper and lower edges. In addition there is to be a rider plate on the top of the keelson-plate, extending over three-fourths of the length of the vessel amidships, riveted to the angle bars, the breadth of which is to be equal to the sum of the two broad flanges of the keelson angles together with the thickness of the centre plate it covers; the thickness of the rider-plate not to be less than prescribed in Table S 3. The butts of the plates and angles forming this keelson to be properly shifted, and to be efficiently butt-strapped.

2. The butts of the vertical plate to be secured with double butt-straps, each not less than $\frac{3}{20}$ of an inch thicker than half the thickness of the plates they connect, and to be treble riveted, or the plates may be lapped and treble riveted; the butt-straps of the rider-plate to be fitted on the upper side, and to be treble riveted; the butt-straps of the angle bars to be of sufficient length to have not less than three rivets in each flange properly arranged on each side of the butt.

3. Vessels in which the number for plating is 33,000 and above are to have a foundation-plate not less than 18 inches broad and $\frac{10}{20}$ of an inch thick fitted on the top of the floors, under the middle line plate keelson.

MIDDLE LINE INTERCOSTAL KEELSON.

4. If a middle line intercostal keelson be adopted, the plates are to be of the thickness prescribed in Table S 3, and riveted to vertical angles of not less size than the reversed frames, to be fitted and attached to all floor-plates; the intercostal plates to extend from the keel to the top of the floors, and to be fitted close to them. A bulb-plate, at least two inches deeper than required for the main deck beams, is to be let down below the top of the floors, between the reversed angles, sufficiently for the intercostal plates to be riveted thereto, and the bulb to be fitted between, and riveted to, two longitudinal angle

bars on the floors, extending all fore and aft, of the size given for keelson angles in Table S 3; or the letting down of the bulb plate may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angles.

5. When intercostal keelsons are adopted with hanging keels, in vessels where the number for plating is 13,000, and under 18,000, instead of a bulb plate there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, having double continuous angles at top and bottom, and a rider plate on its upper edge, of the sizes given in Table S 3; the vertical plate and the rider plate are to be of the thickness required for stringer plates in upper line of Table S 5, and the depth above the floors to be sufficient to admit of the angles being properly fitted. When the number is 18,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table S 3 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table.

6. Where **Flat plate keels** are adopted, intercostal keelson plates attached to the floor plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angles of the dimensions given for keelson angles in Table S 3, riveted all fore and aft to the keel and keelson, the spacing of the rivets not to exceed 5 diameters apart. In vessels where the number for plating is 13,000 and under 15,000, or where the length exceeds ten times the depth, instead of a bulb plate, there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, or connected to the centre through-plate, having double continuous angles, at top and bottom, and a rider plate on its upper edge; the vertical plate and the rider plate are to be not less in thickness than that given in the upper line of Table S 5 for stringer plates, and the depth above the floors to be sufficient to admit of the angles being properly fitted. Where the number is 15,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table S 3 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table. Where the number is 26,000 and above, the flat-plate keel to be doubled for one half the vessel's length amidships.

CENTRE THROUGH-PLATE KEEL AND KEELSON.

7. If the middle line keelson be formed of a centre through-plate, extending from the lower edge of the keel to the top of the floors, it must be $\frac{2}{20}$ of an inch thicker than that required in Table S 3 for intercostal keelsons. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to the double vertical angles riveted to their ends and to the centre plate keelson, there is to be a flat keelson-plate, of the same thickness as, and not less than three-fourths the breadth of, the garboard strakes in Table S 2, riveted to double reversed angles on the upper edge of floors, and to two fore and aft angle bars on the upper edge of the centre through-plate keelson; and where the number for plating is 15,000 and under 18,000, there is to be a bulb plate of the size of the main deck beams, fitted between, and riveted to, two longitudinal angle bars of the size for keelson angles in Table S 3, connected to flat plate keelsons and double reverse bars on top of floors. But, should the centre through-plate keelson be extended above the upper edge of the floors, then it is to be connected by two fore and aft angles of the size given in Table S 3, to two flat plates, one on each side of the middle-line

to be $\frac{2}{20}$ of an inch thicker than that given for intercostal plates, and one-third the breadth of the garboard strakes, to be well riveted to the double reversed angles on the upper edge of the floors. Where the number is 18,000 and above, the centre through-plate keelson is to extend sufficiently high above the floor-plates to take two pairs of double angles of the size given for keelson angles, and there is to be a rider plate fitted on the top, of the thickness of the keelson plate.

8. In all cases the middle line keelson is to be extended as far forward and aft as practicable.

BILGE KEELSONS, AND STRINGERS IN HOLD.

Section 10. 1. All vessels to have bilge keelsons, extending all fore and aft, and placed at the lower turn of the bilges, formed of double angles fitted back to back, of the size given in Table S 3.

2. If the vessel has but a single tier of beams and her number in Table S 3 is under 7,200, a side stringer, formed of the same size angles, is to be fitted about midway between the bilges and upper deck, extending all fore and aft.

3. Where the number is 7,200 and above, and the vessel is under $15\frac{1}{2}$ feet depth to top of keel, two double angle stringers are to be fitted on each side between the bilge keelsons and the deck beams, extending all fore and aft, to be riveted back to back and to double reversed angles on the frames; the size of them not to be less than those used for the middle line keelson.

4. For stringers in hold, see also Section 14.

5. *In the cases of vessels intended to load or discharge on the ground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which under the circumstances they will be subjected.*

SIDE KEELSONS.

Section 11. 1. In vessels where the number in Table S 3 is 13,000 and under 15,000, a double angle keelson is to be fitted on each side, as far forward and aft as practicable, and to be placed about midway between the middle line and bilge keelsons.

2. Where the number is 15,000, and upwards, intercostal plates are to be fitted on each side, as far forward and aft between the floors as practicable, and to be placed about midway between the middle line and bilge keelsons; these plates are to be fitted close to the floors, and to be attached to the outside plating with an angle of not less size than $3 \times 3 \times \frac{7}{20}$; if the plating number is 21,700 and under 30,400, these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$; and if of 30,400 and above, they are not to be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$, the intercostal plates are to extend to the top of the floors, and longitudinal plates, in long lengths of the same thickness as the intercostal plates, are to be let down and riveted to them. These plates are to be fitted between, and riveted to, two longitudinal angles of the size given for keelson angles; or the longitudinal plates may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angles and riveted to them.

3. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms; but where partial double bottoms are fitted, these keelsons are to extend into, or scarph the double bottom not less than three spaces of frames, and to be connected to the longitudinal girders where practicable.

4. Vessels not being of a size to require side intercostal keelson plates are to have washplates of the thickness given for bulkheads in Table S 1, fitted between the middle line and bilge keelsons for not less than half the vessel's length amidships.

DETAILS RELATING TO KEELSONS AND STRINGERS.

Section 12. 1. Where bulb plate is used for keelsons or stringers, the joints are to be overlapped and riveted, or otherwise efficiently connected ; if overlapped, the length of lap must not be less than twice the depth of the bulb plate ; steel of other form than bulb may be used for them if of equal strength.

2. All angle bars for keelsons and stringers are to be in long lengths, properly shifted ; and, wherever butted, to be connected with angle or plate, not less than two feet long, fitted in the throat of them, properly riveted to each flange. The thickness of the connecting plates not to be less than the thickness of the angle bars they connect.

3. In all cases the middle line, side, and bilge keelsons, and, where practicable, the stringers, are to be carried fore and aft continuously through the bulkheads, the latter being made watertight around them ; and, where such parts of the ship are necessarily separated, the longitudinal strength is to be efficiently maintained, to the satisfaction of the Surveyors.

4. The spacing of the stringers at the ends of vessels, having either single or double bottoms, should not exceed the spacing amidships.

5. All keelson and stringer angles may be reduced $\frac{1}{20}$ of an inch in thickness, when above $\frac{7}{20}$ of an inch amidships, for one-fifth the vessel's length at each end.

6. Where keelsons, or other longitudinal strengthening, are required for a certain portion of the length of a vessel care should be taken to lap or properly shift the same, so as to avoid any abrupt termination of strength.

BEAMS.

Section 13. 1. Beams are to be of the form and size given in Table S 4 ; or they may be composed of any other approved form equal in strength.

2. The beams at the ends of spar and upper deck hatchways, of from six to ten frame spaces in length must be equal in size to those of the main or middle deck ; and the beams at the ends of awning deck and long bridge hatchways of similar length are to be of the same size as required for spar deck beams.

3. Strong beams in the machinery space of steamers must, in all cases, have double angles on their upper and lower edges.

4. In **Sailing ships** where the length of the midship hold beam exceeds 39 feet, the hold beams for half length amidships to be one inch more in depth than prescribed in Table S 4, unless they be additionally supported by quarter pillars on alternate beams for the same length. But where the length of midship-hold beam is 43 feet and upwards, both the upper and lower deck beams are to be additionally supported by quarter pillars of the diameter given in Table S 1 for hold and deck pillars at alternate beams, for not less than one-half the vessel's length amidships. When the length of the midship upper deck beams in sailing vessels exceeds 36 feet, the bracket knees to each tier of beams are not to be less than 3 times the depth of the beam, and the depth at the throat to be not less than once and three-quarters the depth of the beam.

5. In steam vessels of 43 feet and under 55 feet in breadth, the beams are to be supported by quarter pillars at alternate beams for half the vessel's length amidships, in addition to the centre line pillars; and in vessels of 55 feet in breadth and above, the quarter pillars of the diameter given in Table S 1 for hold and deck pillars are to be fitted to every beam. In steamers where the middle deck is fitted exclusively for the accommodation of passengers, quarter pillars need not be fitted if the ship is less than 50 feet in breadth.

6. Beams to be well and efficiently riveted to the frames, with bracket ends or knee-plates; each arm of knee-plates not to be less in length than twice and a half, and the depth at the throat not less than once and a half, the depth of beams, and to be in thickness equal to the beams; and not more than 2 holes in each beam arm or frame to be punched before the beam is in place.

7. The round up of the beams of all weather decks should not be less than one quarter of an inch per foot of length of beam. This round up of beam will be assumed in taking the measurement for regulating the scantlings, and arrangement of beams and stringers in hold; and in all cases where a freeboard is assigned by the Committee, this amount of round-up will be assumed as the standard in determining the minimum freeboard which is required for insertion in the Register Book.

8. The beams of the various decks, or of tiers of beams, are to be placed over each other. For variations and reductions in sizes of beams at the ends of vessels see Table S 4, and footnotes.

9. The knees of beam 6 inches in depth to be secured to the frames by not less than four $\frac{3}{4}$ inch rivets. Beams of 7 inches to $8\frac{1}{2}$ inches in depth to have five $\frac{3}{4}$ inch rivets; beams 9 inches to $9\frac{1}{2}$ inches to have five $\frac{7}{8}$ inch rivets; beams 10 inches to $10\frac{1}{2}$ inches to have six $\frac{7}{8}$ inch rivets: and beams 11 inches to 12 inches to have seven $\frac{7}{8}$ inch rivets in the knees.

10. Where beam knees are required to be three times the depth of the beam an additional rivet is to be fitted.

SPACING OF BEAMS AND STRINGERS IN HOLD.

Section 14. 1. The spacing of beams is to be regulated by the depth amidships, measured from the top of keel to the top of the upper, spar, or awning-deck beams as described in Section 1, paragraph 8, excepting in awning-decked vessels of less than $17\frac{1}{2}$ feet depth to the main deck, in which case the arrangement of stringers in hold, &c., is to be regulated by the depth to the main deck. (*See* also Section 10, paragraphs 2 and 3.)

2. All upper deck beams and the middle deck beams of three-decked ships, and the main deck beams of spar and awning-decked ships, to be fastened to alternate frames, except where steel decks are fitted as provided for in Table S 4.

3. All Vessels under 13 feet in depth are to have a double angle stringer extending all fore and aft about midway between bilge keelson and deck beams, riveted back to back and to double reversed angles on the frames.

4. All Vessels of 13 and under 14 feet in depth to have, in addition to the foregoing, bulb plate of the size required for the deck beams, riveted between the continuous double angle stringer for three-fifths the vessel's length amidships; or the bulb may be dispensed with, provided that, in lieu thereof, intercostal plates in long lengths be fitted between the double angle stringer, and attached by single angle bars to the outside plating.

5. All Vessels of 14 and under $15\frac{1}{2}$ feet in depth to have, instead of the bulb plate, as described

above, a plate not less than 12 inches wide and $\frac{7}{20}$ of an inch thick, connected to the outside plating, with double angles fitted on the inner edge of the size of the keelson angles, extending all fore and aft.

6. All Vessels of $15\frac{1}{2}$ feet depth and above to have a double angle stringer of the size given in Table S 3, extending all fore and aft at the upper turn of the bilge on each side.

7. All Vessels of $15\frac{1}{2}$ and under $16\frac{1}{2}$ feet in depth to have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with a stringer plate of the size given in Table S 5 for hold beam stringers, attached to the plating and supported by brackets at every alternate frame between the beams, and secured to the beams by efficient gusset plates.

8. All Vessels of $16\frac{1}{2}$ and under $17\frac{1}{2}$ feet in depth to have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table S 5, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate. On the inner edge of the stringer plate, between the beams, an angle bar is to be fitted, of the size given for keelson angles in Table S 3, with its deep flange vertical, and covering the ends of the bracket plates.

9. All Vessels of $17\frac{1}{2}$ and under $18\frac{1}{2}$ feet in depth to have hold or lower deck beams fastened to every second and fourth frame alternately, or they may have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case.

10. All Vessels of $18\frac{1}{2}$ and under $19\frac{1}{2}$ feet in depth to have hold or lower deck beams fastened to every second and fourth frame alternately; or they may have hold beams as described in the foregoing paragraph, fastened to every tenth frame, provided double angle bars $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$, be fitted on the inner edge of the stringer plates with a face plate $\frac{7}{20}$ of an inch in thickness, and gusset plates at the beam ends.

SAILING VESSELS.

11. **Sailing Vessels** of $19\frac{1}{2}$ and under 23 feet in depth to have hold or lower deck beams fitted to every alternate frame.

12. Sailing Vessels of 23 and under 24 feet in depth from the upper part of the upper deck beams, or of 16 and under 17 feet from the upper part of the hold or lower deck beams to the top of the keel, to have the lower deck beams fitted to every alternate frame, and to have two double angle stringers extending fore and aft, between the bilge keelson and hold or lower deck beams, on each side.

13. Sailing Vessels of 24 and under 26 feet in depth from the upper part of the upper deck beams, or 17 and under 18 feet from top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have in addition to the above, bulb plates of the size of the hold beams fitted and riveted between each of the two side stringers in lower hold on both sides, to extend all fore and aft.

14. Sailing Vessels of 26 and under 27 feet in depth, from the upper part of the upper deck beams, or 18 and under 19 feet in depth, from top of lower deck beams, to have, in addition to the foregoing, intercostal plates of the thickness given in Table S 3, attached to the outside plating, and fitted to the upper stringer, all fore and aft, and to the lower stringer from one-fourth of the vessel's length aft, until it is incorporated with the panting stringer.

15. Sailing Vessels of 27 and under $28\frac{1}{2}$ feet in depth from upper deck, or of 19 and under $20\frac{1}{2}$ feet in depth from top of lower deck beams, are to have the lower deck beams fitted to every alternate frame,

and to have orlop stringer plates of the dimensions required for hold beam stringer plates in Table S 5 fitted and attached to the outside plating and reversed frames by angle bars of the size given in Table S 3; these stringers to be supported by bracket-plates riveted to them, and to alternate frames; and upon the inner edge of the stringer-plate an angle bar of the size of keelson angles, as per Table S 3, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates. Or, if preferred, an additional side stringer to those required in the preceding paragraph may be fitted, formed of double angles, bulb, and intercostal plates attached to the outside plating and fitted all fore and aft.

16. Sailing Vessels of $28\frac{1}{2}$ and under $29\frac{1}{2}$ feet in depth from the upper deck, or of $20\frac{1}{2}$ and under $21\frac{1}{2}$ feet from the top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have orlop beams of the size given in Table S 4 for "hold beams of extra strength" fitted to every tenth frame, with an angle bar on the inner edge of the stringer plate, as in the preceding paragraph; or these beams may be twelve frame spaces apart, provided double angles $4 \times 3\frac{1}{2} \times \frac{7}{20}$, be fitted on the inner edge of the stringer plate with their deep flange vertical, and with a face plate $\frac{8}{20}$ of an inch in thickness. These beams are to be secured to the stringer plate by efficient gusset plates.

17. Sailing Vessels, when the Plating Number is 24,000 and under 27,000, are to have a bulb plate of the size required by Table S 4 for the lower deck beams fitted to the side keelson for two-thirds the length of the vessel amidships, and intercostal plates are to be fitted to the bilge keelson for half the vessel's length amidships. When the Plating Number is 27,000 and under 30,000, a vertical plate is to be fitted to the side keelson for two-thirds the vessel's length amidships, the plate to be one-half the depth, and the same thickness as that required for the middle line keelson, with double angles and a rider plate on the upper edge. The double angles to be of the size required for upper deck stringer angles, and the rider plate to be of the same thickness as the vertical plate. In addition to this, intercostal plates are to be fitted to the bilge keelson for half-length amidships, with a bulb plate of the size required for lower deck beams for three-fifths the length of the vessel amidships. When the Plating Number is 30,000 and under 33,000, a vertical plate is to be fitted to the side keelson for two-thirds the vessel's length amidships, the plate to be three-fourths the depth of and the same thickness as that required for the middle line keelson, with double angles and a rider plate fitted on the upper edge. The double angles to be of the size required for upper deck stringer angles, and the rider plate to be of the same thickness as the vertical plate. In addition to this, intercostal plates are to be fitted to the bilge keelson for two-thirds the length amidships, with a bulb plate of the size required for lower deck beams for three-fifths the length.

STEAM VESSELS.

18. **Steam Vessels** of $19\frac{1}{2}$ and under 22 feet in depth to have hold beams fastened to every alternate frame; or hold beams of extra strength, as given in Table S 4, may be fitted to every eighth frame, provided an angle bar, of the size given for keelson angles in Table S 3, be fitted on the inner edge of the stringer plate, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angle bars $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$, and a face plate, $\frac{8}{20}$ of an inch in thickness, be fitted on the inner edge of the stringer plate, with gusset plates as above.

19. Steam Vessels of 22 and under 23 feet in depth to have, in addition to the foregoing, an extra side stringer, formed of double angles of the size of the keelson angles, fitted between the hold beams and bilge stringer, extending as far forward and aft as practicable.

20. STEAM VESSELS of 23 and under 24 feet in depth to have, in addition to the above, a bulb plate of the size required for hold beams, fitted between the double angles of each of the side stringers, all fore and aft.

21. STEAM VESSELS of 24 and under 26 feet in depth from the upper part of the upper deck beams, or of 17 and under 18 feet from the upper part of the lower deck beams to the top of the keel, to have the lower deck beams fitted to every alternate frame, and to have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table S 5 for hold beam stringer plates; and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; and on the inner edge of the stringer plate, between the beams, an angle bar is to be fitted, of the size given for keelson angles in Table S 3, with its deep flange vertical, and covering the ends of the bracket plates.

22. STEAM VESSELS of 26 and under 27 feet in depth from the upper deck, or 18 and under 19 feet from top of the middle deck beams, to have hold beams fastened to every second and fourth frame alternately. Or they may have hold beams of extra strength, as given in Table S 4, fastened to every eighth frame, and to have an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case; or they may be spaced wider, not exceeding ten frame spaces, provided double angles $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$ be fitted on the inner edge of the stringer plate, with a face plate on them $\frac{8}{20}$ of an inch in thickness.

23. STEAM VESSELS of 27 and under 28 feet in depth from the upper deck, or 19 and under 20 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every second and fourth frame alternately. Or they may have hold beams of extra strength as given in Table S 4, fastened to every eighth frame, and to have an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case; or these beams may be ten frame spaces apart, provided double angles $4 \times 3\frac{1}{2} \times \frac{7}{20}$ be fitted on the inner edge of stringer plate with their deep flange vertical and with a face plate $\frac{8}{20}$ of an inch in thickness.

24. STEAM VESSELS of 28 and under 30 feet in depth from the upper deck, or 20 feet and under 22 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame. Or if hold beams of extra strength, as given in Table S 4, be fitted, they may be fastened to every eighth frame, provided an angle bar of the size given for keelson angles in Table S 3, be fitted on the inner edge of the stringer plate and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angles, $4 \times 4 \times \frac{8}{20}$, and a face plate $\frac{9}{20}$ of an inch in thickness be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends.

25. STEAM VESSELS of 30 and under $32\frac{1}{2}$ feet in depth from the upper deck, or 22 and under $24\frac{1}{2}$ feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame. Or if hold beams of extra strength, as given in Table S 4, be fitted, they may be fastened to every eighth frame, provided an angle bar of the size given for keelson angles in Table S 3, be fitted on the inner edge of the stringer plate, and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angles $4 \times 4 \times \frac{8}{20}$, and a face plate $\frac{9}{20}$ of an inch in thickness, be fitted on the inner edge of the stringer plate, with gusset plates at the

beam ends. In either case, in addition, a double angle stringer, of the size given for keelson angles in Table S 3, with bulb plate between, is to be fitted midway between the bilge stringer and the hold beams.

26. STEAM VESSELS of 32½ and under 36 feet in depth from the top of the upper deck beams to the top of keel, or in which the depth from the top of the lower deck beams is 17½ and under 21 feet, to have the lower deck or hold beams fitted to every alternate frame, and to have below them an orlop stringer plate attached to the outside plating and reverse frames, of the thickness, and three-fourths of the breadth, of the lower deck stringer plates, supported by bracket plates riveted to them and to alternate frames; and upon the inner edge of the stringer plate an angle bar, of the size of keelson angles, as per Table S 3, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or a stringer of other form may be fitted, if approved by the Committee.

27. STEAM VESSELS of 36 and under 39 feet in depth from the top of the upper deck beams to the top of keel, or in which the depth from the top of the lower deck or hold beams is 21 feet or above, are to have the lower deck beams fitted to every alternate frame, and to have orlop beams, of the size given in Table S 4 for "hold beams of extra strength," fitted to every tenth frame, with stringer plates on them, and gusset plates at their ends. The stringer plates to have angle bars on their inner edge, as in preceding paragraph.

28. Gusset plates to be fitted to hold beam stringer plates at all bulkheads where strong hold beams are fitted.

29. Plans of all vessels above 39 feet in depth must be submitted for the consideration of the Committee, with a view to additional strength being provided. And in all vessels where the height between deck stringers at the sides is 8 feet or above, at any part, additional transverse strength at such part must be submitted for approval.

30. When the beams exceed two spaces of frames apart, a knee or bracket plate is to be riveted to alternate frames and to the stringer plate of the thickness required for the frames amidships.

31. Notwithstanding the foregoing arrangements for the spacing of beams, whenever a deck is laid, the beams are not to be further apart than two frame spaces.

32. Where it is necessary, in consequence of long hatchways, engine-rooms, boiler spaces, &c., to dispense with some of the hold or lower deck beams, compensation must be made by fitting hold beams of extra strength, as given in Table S 4, with gusset plates, and angle bars, &c., on the stringer plates, or extra web frames to the satisfaction of the Committee.

33. If an arrangement differing from the foregoing in the spacing of the hold beams, to suit convenience of stowage, be required, a sketch showing beams and stringers of extra strength, or web frames with all particulars, must be submitted through the resident Surveyors, who are to state their opinion thereon, for the Committee's consideration.

34. In way of raised quarter decks, where the depth from the top of the keel to the top of the raised quarter deck beam is 24 feet, or above, and the lower deck hatchways are not framed, a web frame is to be fitted abreast of the hatchway, extending from the floors to the upper deck. Where web frames are fitted in lieu of strong hold beams and the lower deck hatchways are not framed, the web frames in way of the hatchways are to be spaced as required by Section 14a, and extended to the upper deck.

WEB FRAMES IN LIEU OF HOLD BEAMS. (See also Sketches after page 151.)

Section 14a. 1. Web frames in conjunction with side stringers in hold will be admitted in

lieu of wide spaced hold beams and stringers, if arranged in accordance with the conditions specified below :—

The depth of the vessel for regulating the spacing and depth of web frames, and the number of side stringers required to be fitted, is to be taken from the top of the keel to the top of the first complete tier of beams (other than wide spaced beams), assuming the beams to have the normal round up of one quarter of an inch to the foot of length of beams.

2. When web frames and side stringers are fitted in lieu of hold beams, the web frames and stringers to be of the thickness required for the frames.

3. Double angles are to be riveted on the inner edge of the web frames and stringers ; these angles and those connecting the stringers to the web frames and outside plating, also the angles connecting the stringers to the reversed frames, between the web frames, are to be of the same size as the reversed frames. Single angles of equivalent strength may be substituted for the double angles described above provided double angles be fitted in way of the diamond plates described in next paragraph. The web frames to be attached to the margin plate of double bottom by double angles, or to the inner bottom by efficient gusset plates.

4. An efficient diamond plate of the thickness of the web frames is to be fitted at the junction of the web frames and stringers, and to be not less than 24 inches × 18 inches for web frames 14 inches deep ; 30 inches × 21 inches for web frames 15 inches deep ; and 30 inches × 24 inches when the depth of the web frames exceeds 15 inches.

5. The through beams attached to the head of web frames are to be in all cases of the depth required for "beams of extra strength," excepting where an iron or steel deck is fitted on these beams in which case they may be of the ordinary rule size of beams to alternate frames, provided the knees be three times the depth of the beam. Where web frames are extended to the upper or raised quarter-deck in vessels of 23 feet depth to the top of keel and above, the depth of beam knees to be three times the depth of the beam.

6. When web frames are fitted in way of half beams they are to be connected at the head by large bracket knee plates.

7. The side stringers are to be supported by a bracket knee plate of the thickness required for frames midway between the web frames, when 18 inches in width, except when the web frames are spaced 8 feet apart, when the bracket plates will not be required.

8. On those frames where web frames are not fitted the reversed frames are to extend to the upper deck and the stringer plate next below alternately, except in three-deck and spar-decked vessels where web frames are fitted below the middle deck, in which case the reversed frames are to extend as specified in Section 41, paragraph 5, and Section 42, paragraph 6 respectively.

9. **Vessels of under 16 feet in depth from top of keel,** requiring hold beams, to have web frames 14 inches in depth, eight frame spaces apart, with one side stringer plate above the bilge stringer, fitted intercostally between the web frames, and connected to them by angles and diamond plates as previously described.

10. **Vessels of 16 feet and under 17 feet in depth,** to have web frames 15 inches deep, not more than eight frame spaces apart, with one side stringer plate above the bilge stringer as described in preceding paragraph.

11. **Vessels of 17 feet and under 18 feet in depth,** to have web frames 15 inches deep not more than eight frame spaces apart with two side stringers, in which case the double angle bilge stringer may be omitted (except in vessels requiring three tiers of beams, and under 18 feet to the middle or lower deck, when the web frames should be not more than six frame spaces apart).

12. **Vessels of 18 feet and under 21½ feet in depth,** to have web frames 15 inches deep, not more than six frame spaces apart with two side stringers. When of this depth to the middle deck, the web frames are to be 18 inches deep.

13. **Vessels of 21½ feet and under 22½ feet in depth,** to have web frames 15 inches deep, not more than six frame spaces apart with three side stringers, or web frames with two side stringers 18 inches deep may be substituted, in vessels fitted with a double bottom, provided the brackets outside the margin plate be extended up the bilges to a height of three times the depth of the ordinary rule floor at the middle line. When of this depth to the middle deck, the web frames to be 18 inches deep, with three side stringers.

14. **Vessels of 22½ feet and under 23½ feet in depth,** to have web frames 16 inches deep, not more than six frame spaces apart with three side stringers. When of this depth to the middle deck, the web frames to be 18 inches deep.

15. **Vessels of 23½ feet and under 24 feet in depth,** to have web frames 18 inches deep, spaced not more than six frame spaces apart, with three side stringers, as in the preceding paragraph.

Web frames in way of RAISED QUARTER-DECKS, in lieu of lower deck beams and beams of extra strength wide spaced in lower hold.

16. **Vessels of 24 feet and under 25 feet** to the quarter-deck, to have web frames 16 inches deep, five frame spaces apart with three side stringers; and not less than four beams of extra strength, formed of plate and four angles as prescribed in Table S 4 are to be fitted and efficiently connected to one of the side stringers, and to the web frames by large gusset plates and vertical bracket plates, of the thickness of the side stringers. In addition, a water-tight transverse bulkhead to be fitted about midway between the after engine-room bulkhead and the after end of the vessel.

17. **Vessels of 25 feet and under 26 feet,** to have web frames 16 inches deep, from four to five frame spaces apart, with three side stringers, and not less than four beams of extra strength, and an additional water-tight bulkhead as in preceding paragraph.

18. **Vessels of 26 feet and under 27 feet,** to have web frames 18 inches deep, four frames spaces apart, with three side stringers and not less than four strong beams, and an additional bulkhead as above.

19. **Vessels of 27 feet and under 28 feet,** to have web frames 18 inches deep, four frame spaces apart, with four side stringers, and not less than four strong beams, and an additional bulkhead as previously described.

20. In all cases where web frames are fitted in lieu of lower deck and hold beams, as set forth in the foregoing paragraphs, the bulkheads are to be additionally stiffened by a centre vertical web and semi-box beam, so as to compensate in an efficient manner for the omission of the support which would be afforded by these decks in case such were fitted.

PILLARS.

Section 15. 1. All beams the length of which exceeds one half that of the midship upper deck beams to be pillared where practicable. Where pillars are required to the upper deck beams the pillaring

must be completed down to the keelson. The pillars to the coamings of hatchways should not exceed 4 frame spaces apart on each side, and all hatchways 26 feet in length and above are to be pillared at the corners ; in addition, the beams under deck houses, bowsprit, pall bitt, windlass, steam winches, and capstan are to be pillared, and wherever else the Surveyors may deem necessary; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper, spar, or awning deck, and to be of the sizes given in Table S 1. Where a vessel has three decks or tiers of beams, the size of the pillars to the middle tier is to be a mean between the sizes given in Table S 1.

2. In **Sailing Ships** where the length of the midship hold beam exceeds 39 feet, the hold beams for half length amidships to be one inch more in depth than prescribed in Table S 4, unless they be additionally pillared by quarter pillars on alternate beams for the same length. But where the length of midship hold beam is 43 feet and upwards, both the upper and lower deck beams are to be additionally supported by quarter pillars at alternate beams, of the diameter given in Table S 1 for hold and deck pillars, for not less than one-half of the vessel's length amidships.

3. In **Steam Vessels** of 43 feet and under 55 feet in breadth, the beams are to be supported by quarter pillars at alternate beams for three-fourths the vessel's length amidships, in addition to the centre line pillars, and in vessels of 55 feet in breadth and above the quarter pillars of the diameter given in Table S 1 for hold and deck pillars are to be fitted to every beam. In steamers where the middle deck is fitted exclusively for the accommodation of passengers, quarter pillars need not be fitted in the 'tween decks if the vessel is less than 50 feet in breadth.

4. Quarter pillars to be of the diameter given in Table S 1 for hold and deck pillars.

5. All pillars to have solid welded heads and heels.

6. Pillars which extend from the keelson to the upper deck beams in vessels with two decks, or tiers of beams, or with one deck and web frames ; or to the middle deck beams in vessels with three decks, or tiers of beams, or with two decks and web frames ; and the hold pillars in sailing ships of 22 feet depth of hold and above, are to have their diameter increased by $\frac{3}{8}$ of an inch beyond that given in Table S 1. When pillars extend in one length from the floors to the upper deck in vessels requiring three tiers of beams, their diameter is to be increased $\frac{3}{4}$ of an inch beyond that given in Table S 1 for hold pillars.

7. Where double pillars are fitted for the purpose of securing shifting boards, they are not to be less than three-fourths the diameter for single pillars.

8. Where hollow pillars are to be used, they are to be of malleable steel or iron, of the diameter and thickness given in Table S 1, with solid welded heads and heels.

9. If pillars be fitted on a shaft tunnel, the tunnel should be strengthened in way of them, by doubling plates, angle bars, and a transverse vertical plate, or by other efficient means to the satisfaction of the Surveyors, but it is considered preferable that the pillars be fitted clear of the tunnel.

10. The beams in the engine room to be pillared wherever practicable.

11. Where a middle line bulkhead is fitted in lieu of pillars, the thickness is not to be less than $\frac{5}{16}$ of an inch, connected at the bottom and to plating on the beams by double angles not less than $3 \times 3 \times \frac{7}{16}$, and stiffened vertically by double angles or tee bars of equivalent strength to the pillars required by Table S 1, and paragraph 6 of this section, spaced two frame spaces apart ; the stiffeners on one side of the bulkhead to be attached to the beams.

STRINGERS ON BEAMS.

Section 16. 1. All vessels to have stringer plates upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one and two deck vessels, the upper and middle deck beams of three deck vessels, and upon the main deck beams of spar and awning-decked vessels, to be of the breadth and thickness given for main stringer plates in Table S 5, for half the vessel's length amidships; from thence to the ends of the vessels they may be gradually reduced to the dimensions given for the ends of main stringer plates in Table S 5.

2. The stringer plates on ends of the beams next below the upper deck in two deck vessels, and below the middle deck in three deck vessels, and below the main deck in spar or awning-decked vessels to be of the breadth and thickness given for hold beam and lower deck stringers in Table S 5.

3. The stringer plates on the ends of spar-deck beams are to be the breadth of, and may be $\frac{1}{20}$ of an inch less in thickness than, the stringer plates given on the upper line of Table S 5 for vessels of the same plating number, and may be reduced at their ends $\frac{1}{20}$ of an inch in thickness, and to the breadth given for the ends of main deck stringer plates in Table S 5.

4. The stringer plates on the ends of awning-deck beams to be as per Section 43, par. 9.

5. The stringer plates on all tiers of beams are to be fitted home and riveted to the outside plating, all fore and aft, with angle bars of the dimensions required by Table S 3; the middle, lower, and orlop deck stringer plates to have an additional angle bar of the same dimensions extending all fore and aft, riveted to the reversed frames and to the stringer plates. (For riveting of butts see Section 20.)

6. In cases where no deck is laid, and the width of the stringer plate on the ends of the hold beams is objected to, it may be reduced, provided such reduction be fully compensated for and receive the sanction of the Committee.

7. When the frames are extended through the upper deck stringer plate to form frames for bridge-houses, or poops and forecastles, there must be a continuous angle bar, of the size given for lower deck stringer angles, wrought on the upper deck stringer plate inside the frames.

8. The main and hold beam stringer plates may be reduced at the ends of the vessel to the sizes given for the same in Table S 5.

9. The upper deck stringer angle bar is in all cases to be fitted on the upper side of the stringer plate.

10. When gutter waterways are fitted to upper decks in vessels having poops or forecastles, the angle bars forming the ends of the gutters are to be welded, and the gutters to be carefully caulked.

TIE-PLATES ON BEAMS.

Section 17. 1. All vessels to have tie-plates ranging all fore and aft upon each side of the hatchways on each tier of beams, these plates to be lapped or butted, and at least double riveted. Upon hold beams, or lower deck beams spaced two to four frame spaces apart, on which no deck is to be laid, or where tie-plates would interfere with stowage of cargo, double angle bars of the dimensions given in Table S 3 for angle bars on lower deck beam stringer plates, placed at middle line or at each side of the hatchways, extending fore and aft wherever practicable, and well riveted to all beams and stringers, will be admitted in lieu thereof.

2. Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged; and in addition, where the plating number is 15,000 and above diagonal tie-plates are to be fitted all fore and aft on the upper deck.

3. Where diagonal tie-plates cross each other, or the fore and aft tie-plates, between the beams, and a deck is to be laid thereon, one set of tie-plates must be set down in way of the crossing, so as to leave one thickness only projecting above the beams.

4. The tie-plates to be of the width and thickness given in Table S 5, for half the vessel's length amidships, tapered at the ends to the same thickness as the ends of the stringer plates. They are to be well riveted to each other and to the beams and stringers; and all butts to be properly shifted.

HOOKS AND CRUTCHES AND PANTING ARRANGEMENTS.

Section 18. 1. All stringers, where practicable, to extend fore and aft, and to be efficiently connected at their ends with plates forming hooks and crutches of the same thickness as the floor-plates amidships, and those below the hold beams should be spaced about 4 feet apart. In vessels whose plating number is 24,000, or above, an additional hook or crutch should be fitted at the ends of the vessel, between each tier of beams, to the satisfaction of the Surveyors.

2. The depth for regulating the number of tiers of beams to alternate frames in the fore peak to be taken at the collision bulkhead, and the beams fitted in accordance with Section 14 for this depth. All vessels to have, in addition, provision made to prevent panting by extra beams, bracket knees and stringer plates being fitted before and abaft the collision bulkhead. Panting beams and stringers to be fitted at the after end where considered necessary by the Surveyors.

3. Sailing vessels under 20 feet in depth at the collision bulkhead, to have lower deck or panting beams fitted to alternate frames in the peak, with a stringer plate two-thirds the breath of the lower deck stringer plate amidships. Vessels 20 feet and under 30½ feet in depth to have in addition to the lower deck beams, a tier of panting beams with a stringer plate two-thirds the breadth of the lower deck stringer plate amidships. Vessels 30½ feet and under 33 feet in depth to have two tiers of panting beams below the lower deck with stringer plates on their ends.

4. The stringer plates on the panting beams to be attached to the outside plating when fitted in continuation of intercostal stringers. These plates are to extend abaft the collision bulkhead for a length of not less than one-fourth the midship breadth of the vessel, and be efficiently supported by brackets at alternate frames. Panting beams and stringers to be fitted at the after end where considered necessary by the Surveyors.

5. Plans of proposed panting arrangements in vessels of 33 feet in depth and above to be submitted for the consideration of the Committee.

PLATING.*

Section 19. 1. The thickness of the outside plating as given in Table S 2, for half the vessel's length amidships, is to be maintained for that length, but it may thence be gradually reduced to the thickness

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have the butt-straps double or treble riveted, as may be required by Section 20, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges.

given for the extreme ends, by gradations of $\frac{1}{20}$ of an inch over equal parts before and abaft the half-length amidships. In all screw steamers the garboard plates connected to the stern frame, and where the plating number is 16,600 or above, also the after lengths of plating so connected, must be of the thickness required for the same strakes amidships. In sailing vessels, the outside or overlapping strakes of plating for one-quarter of the vessel's length at her fore end should only be reduced $\frac{1}{20}$ of an inch from the midship thickness; and where the plating number is 16,000 or above, three strakes of plating at the bilges are to be increased $\frac{1}{20}$ of an inch in thickness throughout, and when the plating number is 22,000 and above, the strake of plating in way of the hold beams is to be increased $\frac{1}{20}$ of an inch in thickness for one-half the vessel's length amidships.

2. In the columns for plating in Table S 2, where two thicknesses are given they are to be worked in alternate strakes, and the greater thickness is to apply to the outer strakes, and the lesser thickness to the inner strakes; and the size of the rivets and double riveting are to be regulated by the thickness of the thicker plating.

3. No plates to be less in length than six spaces of frames, except the fore and after lengths.

4. No butts of outside plating in adjoining strakes to be nearer each other than two spaces of frames; and the butts of the alternate strakes not to be under each other, but shifted not less than one frame space.

5. The butts of the upper or main deck, and of spar deck stringer plates, in all cases to be shifted not less than two spaces of frames clear of the butts of the sheerstrakes.

6. The butts of the garboard strakes to be shifted clear of the keel scarphs, and not to be nearer each other on opposite sides of the vessel than two spaces of frames.

7. All butts of plating, where practicable, to be planed and fitted close; the edges of the plating to be sheared from their faying surfaces, or the burr caused by shearing to be carefully chipped off, and all outside edges of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

8. The breadth and thickness of the sheerstrakes and garboard strakes to be as given in Table S 2.

9. The sheerstrakes in one, two, and three decked, and spar-decked vessels to be fitted sufficiently high above the upper deck beam ends, so as to take at least two rows of rivets vertically in the butts above the upper flange of the gunwale angle bar.

10. The boss-plates covering the screw shaft are to be the same thickness as the strakes amidships of which they form part where the number for plating is under 13,900; if that number and under 18,700, the plates are to be $\frac{1}{20}$ of an inch thicker; and if the number is 18,700 and under 26,500, the plates are to be $\frac{1}{20}$ of an inch thicker than the midship plating, and the butts treble riveted; and where the number is 26,500 and above, the boss-plates and the plates above and below the same to be $\frac{2}{20}$ of an inch thicker than the midship plating, and their butts double strapped, or lapped and treble riveted; or the boss plates are to be doubled.

11. When plates forming the outside strakes of plating are above 40 inches but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{20}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by Section 20 to be treble riveted, the straps required by that

section should be of this increased thickness excepting where the straps are therein required to be $\frac{4}{20}$ of an inch thicker than the plates.

12. Where gutter waterways are adopted at the upper deck, the butt-straps of the bulwark plating are to be sufficiently broad to receive the spur in the middle of the bulwark stay; and when the plates do not exceed 12 feet in length they are to have stays fitted against the butt-straps, and an intermediate stay is to be fitted between the butts on straps or doubling plates. In no case are the stays which support the bulwarks to be more than 6 feet apart. Their size may be from $1\frac{3}{8}$ in. to 2 in. in diameter, regulated by the length of the stay and the size of the vessel. These arrangements may be modified according to circumstances, if to the satisfaction of the Surveyors.

BUTT-STRAPS AND LINING PIECES.

Section 20. 1. In vessels whose plating number does not exceed 8,000, the butt-straps of the sheerstrake, deck stringer plate, and one strake at the bilges for half the vessel's length amidships are to be $\frac{1}{20}$ of an inch thicker than the plates they connect, and to be double riveted.

2. When the plating number is above 8,000 and not exceeding 13,000, the butt-straps of the sheerstrake, deck stringer plate, and two strakes round the bilges are to be $\frac{2}{20}$ of an inch thicker than the plates they connect, for half the vessel's length amidships, and treble riveted.

3. When the plating number is over 13,000 and not exceeding 16,000, an additional strake of bilge plating is to be treble riveted at the butts for half the length amidships with straps $\frac{2}{20}$ of an inch thicker than the plates they connect.

4. When the plating number is over 16,000 and not exceeding 20,000, the butts of the sheerstrake, deck stringer plate, three strakes of bilge plating, and the remaining outside strakes of plating are to be treble riveted with straps $\frac{2}{20}$ of an inch thicker than the plates they connect, for half the vessel's length amidships.

5. When the plating number is above 20,000 and not exceeding 24,000, all the butts, including those of the upper and middle deck stringer plates, are to be treble riveted for half the vessel's length amidships with straps $\frac{3}{20}$ of an inch thicker than the plates they connect, with the rivets in the back row spaced 5 to $5\frac{1}{4}$ diameters apart; and the remaining butt-straps to be $\frac{2}{20}$ of an inch thicker than the plates.

6. In addition, in vessels where the plating number is 20,000 and under 28,000, the butts of the upper deck stringer plate are to have double straps for half the vessel's length amidships; the thickness of the straps to be as given in paragraph 14 of this section, or, the butts may be lapped and treble riveted; but where the plating number is 28,000 and above, double butt straps are to be fitted to the stringer plates for half the vessel's length.

7. When the plating number is above 24,000 and not exceeding 28,000, all the butt straps, including those of the upper and middle deck stringer plates, are to be treble riveted for three-fourths the length amidships with the back row of rivets spaced 5 to $5\frac{1}{4}$ diameters apart. The butt-straps for half the length amidships to be $\frac{4}{20}$ of an inch thicker than the plates; and the remaining butt-straps $\frac{2}{20}$ of an inch thicker than the plates.

8. When the plating number is above 28,000, the whole of the butt straps all fore and aft, including those of the upper and middle deck stringer plates, are to be treble riveted with the back row of rivets spaced 5 to 5¼ diameters apart, and to be $\frac{4}{20}$ of an inch thicker than the plates they connect for three-fourths the length amidships, and $\frac{2}{20}$ of an inch at the ends. In vessels of this size and exceeding 12 depths in length, double butt-straps to be fitted to the sheerstrake and strake below, or other equivalent strength supplied to the satisfaction of the Committee.

9. The butt-straps of flat keel plates are to be treble riveted, and as much thicker than the plates they connect as is required for bilge strakes.

10. The rivets in the butt straps of outside plating and the upper and middle deck stringer plates to be spaced not more than 3½ diameters apart from centre to centre, except in the back rows in treble riveted butt-straps, which are to be spaced 5 to 5¼ diameters.

11. When plates forming the outside strakes of plating are above 40 inches, but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{20}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by the preceding paragraphs to be treble riveted, they should be of this increased thickness, excepting where the straps are therein required to be $\frac{4}{20}$ of an inch thicker than the plates.

12. All butt-straps to be of the breadth given in Table S 8, and in no case, where single, to be less in thickness than the plates they connect.

13. Where the butts of plating are overlapped, the width of the laps and the riveting of the same are to be as given in Table S 8. In vessels where the plating number is under 16,000, the lap butts of the outside plating for one-half of the vessel's length amidships are to be treble riveted, and the remaining butts double riveted, and where the plating number is 16,000 and above, the lap butts are to be treble riveted throughout. The treble riveted butts to have three complete rows of rivets.

14. Where double butt straps are fitted to stringer plates, sheerstrakes, and outside plating, the thickness of straps to be as given in the following table.

Thickness of Plating.	Strap which is countersunk for rivets.	Strap on opposite side of Plate.
Inches.	Inches.	Inches.
$\frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$
$\frac{10}{20}$	$\frac{8}{20}$	$\frac{6}{20}$
$\frac{11}{20}$	$\frac{8}{20}$	$\frac{7}{20}$
$\frac{12}{20}$	$\frac{9}{20}$	$\frac{7}{20}$
$\frac{13}{20}$	$\frac{10}{20}$	$\frac{8}{20}$
$\frac{14}{20}$	$\frac{10}{20}$	$\frac{9}{20}$
$\frac{15}{20}$	$\frac{11}{20}$	$\frac{9}{20}$
$\frac{16}{20}$	$\frac{12}{20}$	$\frac{10}{20}$

Lining Pieces.

15. The space between the plating and the frames to have solid filling or lining pieces in one length, closely fitted; to be of the same breadth as the frames, excepting in way of bulkheads, where they are to be fitted as stated in Section 22, paragraph 6.

RIVETING AND RIVETS.* (See also Table S 8.)

Section 21. 1. The landing edges of outside plating when $\frac{7}{20}$ of an inch in thickness and above from the keel to the upper turn of bilge, and of the sheerstrake in all cases; and when $\frac{9}{20}$ of an inch and above from the upper turn of bilge to the gunwale, must be double riveted; below these thicknesses the edges may be single riveted. In all cases the thicker of the two plates or angles is to regulate the size of the rivets and the requirements as to double riveting. When the plating is of a thickness amidships to require the edges to be double riveted, the same is to be continued all fore and aft. The stem, stern-post, keel, butts of outside plating, breasthooks, transoms, stringer and tie-plates on beams, also butts of keelsons, stringers, and all longitudinal ties, to be at least double riveted in all vessels.

2. The butts of outside plating to be chain riveted; also all double and treble riveting, except in the keel, stem, and stern post.

3. In the butts of outside plating, a space equal to twice the diameter of the rivet to be between each row; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row in vessels whose plating number is 20,000 or under; and when above this number, the rivets in the back row are to be not more than 5 to $5\frac{1}{4}$ diameters from centre to centre.

4. The overlaps of the edges and butts of plating to be of the breadth given in Table S 8.

5. The rivets are not to be nearer to the butts or edges of the plating, butt-straps, or of any angle bars than a space equal to their own diameter; and in edge riveting the space between any two consecutive rows of rivets must not be less than once and a half their diameter.

6. The rivet holes to be regularly and equally spaced and carefully punched from the faying surfaces opposite each other in the adjoining parts, laps, lining pieces, butt-straps, and frames; and countersinking to extend through the whole thickness of the plate or angle bar (*see* sketches on Table). They are to be spaced not more than $3\frac{1}{2}$ diameters of the rivet apart from centre to centre in the butts of the outside plating, upper, spar, and middle deck stringer plates, and not more than from 4 to $4\frac{1}{2}$ diameters apart in the edges of the plating and at other parts, excepting in the keel, stem, and sternpost, where they may be 5 diameters, and through the keelsons, floors, frames, and reversed frames, frames and outside plating and the beam angles, where they may be 7 diameters apart from centre to centre. The rivets in the flanges of the gunwale angle bars to be spaced not more than $4\frac{1}{2}$ diameters apart from centre to centre, and those connecting steel decks and stringer plates to the beams to be spaced from 7 to 8 diameters apart in each flange of the beam, in the butts of deck plating 4 diameters, and in the edges from 4 to $4\frac{1}{2}$ diameters apart.

7. The spacing of the rivets in the double angles of the flat plate keels is not to exceed 5 diameters.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have the butt-straps double or treble riveted, as may be required by Section 20, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges.

8. For arrangements of rivets showing minimum number in each frame space in the edges of plating amidships, *see* Table S 8.

9. There are not to be less than four rivets in each flange of the angle bars between the frames which connect the stringer plates and intercostal plates to the outside plating where the spacing of the frames from centre to centre is 23 inches and above; but where the frames are closer spaced, there are not to be less than three rivets.

10. The rivets are to be of the best quality, and to be in diameter as per Table S 8, and to be increased in size under their heads to fill the rivet holes. When riveted up, the rivets are completely to fill the holes, their heads are to be "laid up," and their points or outer ends are not to be below the surface of the plating. Rudder rivets should be of not less size than required for the upper edge of the garboard-strake amidships, and spaced not more than five diameters from centre to centre. The plates to be countersunk, and the rivets to have full heads and points.

BULKHEADS.

Section 22. 1. Screw Steamers, in addition to the engine-room bulkheads, to have a water-tight bulkhead built at a reasonable distance from each end of the vessel. In steamers 280 feet long and above, an additional bulkhead is to be fitted in the main hold about midway between the collision and engine room bulkheads, and extending to the upper deck in vessels with one, two, or three decks, and to the spar deck in spar-decked vessels, and to the main deck in awning-decked vessels; and in steamers of 330 feet long and above, an additional bulkhead is to be fitted in the after hold extending to the same height.

2. The foremost or collision bulkhead to be fitted at not less than half the midship breadth of vessel abaft the stem at the lower deck, and in all cases to extend from the floor-plates to the upper, spar, or awning deck, and its water-tightness is to be tested by filling the peak with water to the height of the load line.

3. When a bulkhead is not completed at one pair of frames from the floor-plate up to its prescribed height per rule, but is recessed, stepped, or stopped at an intermediate part, the water-tightness is to be completed with collars or chocks forming a "metal to metal" connection, to the exclusion of cement, wood, &c. The bulkheads to be connected to the decks and to double bottom plating by double angles of the size of the reversed frame.

4. The engine-room bulkheads to extend from the floor-plates to the upper deck, in vessels with one, two, or three decks; and to the spar deck in spar-decked vessels, and main deck in awning-decked vessels. The aftermost bulkhead will be required to extend to the height of the upper or spar deck, unless a different arrangement of bulkheads be approved by the Committee. This bulkhead is to be made water-tight by a stuffing box where the screw shaft passes through, and its water-tightness is to be tested by the after compartment being filled with water to the height of the load line.

5. In sailing vessels the foremost or collision bulkhead only will be required.

6. All plating of bulkheads to be of the thickness prescribed in Table S 1, fitted between two frames at each side of the vessel and to be strongly riveted to them, and to be connected to the floor plates by a double row of rivets. Doubling plates between frames and outside plating in way of

bulkheads, are to extend in one piece from the foreside of the frame afore to the aftside of the frame abaft the bulkhead frames.

7. The bulkheads to be supported vertically on one side and horizontally on the other, with angle bars of not less size than required for the main frames. The vertical angles to be not more than 2 feet 6 inches apart, and their lower ends to extend well down over the floor plates; or, where a double bottom is fitted, they are to be connected to the inner bottom plating by plate brackets. The horizontal stiffeners are not to exceed 4 feet apart, below where the bulkhead is supported by a laid deck, and, when of bulb angle, they are to be attached with brackets to the vessel's sides. In all collision bulkheads and other bulkheads of 40 feet and above in breadth, the horizontal stiffeners are to be of bulb angles, of the size required by Table S 4, for bulb angle beams under a steel or iron deck. All bulkheads of 36 feet and under 45 feet in breadth, to be additionally stiffened by a vertical web at the middle line, extending from the keelson to the hold or lower deck beams, Bulkheads of 45 feet and under 55 feet in breadth, to have two vertical webs, and bulkheads of 55 feet and under 60 feet in breadth to be fitted with three vertical webs.

8. In vessels of a depth to require lower deck, hold, or orlop beams, when the bulkheads are not supported on both sides by a lower or orlop deck, they are to be additionally supported by a semi-box beam of the scantlings required by Table S 4 for such beams; the same to be fitted in way of the hold or orlop stringer plate, or the side stringer midway between the floor plates and the lowest laid deck.

9. All such bulkheads to be caulked and made thoroughly watertight.

10. When a recess extending above the hold beams is formed in the engine room bulkheads the bulkhead is to be efficiently connected from side to side by tie or bridle beams, strongly riveted to the plating and fitted with efficient gusset plates.

DECKS.

WOOD DECKS.

Section 23. 1. The flat of decks, if of wood, to be of good quality, properly seasoned, free from sap and objectionable knots; the thickness and fastenings as per Table S 3.

2. Pine planks for weather decks should not be laid within a period of from four to six months (according to their thickness) after being cut; and where pitch pine is used for weather decks, the breadth of the planks should not exceed 5 inches, and the period of seasoning should not be less than six months.

3. Oregon pine of good quality will be admitted for decks of vessels, provided it be laid with the grain vertical, and the width of planks and period of seasoning be as required for pitch pine.

4. The above required periods of seasoning will not be necessary in cases where satisfactory artificial means of seasoning are adopted.

5. The Surveyors must ascertain that the requirement as to the seasoning has been complied with, and special attention should also be directed to the laying of the decks and to the caulking of the seams and rents.

6. In all cases the margin or boundary planks of weather decks to be either Teak or Greenheart.

7. If the deck is of teak, the thickness to be as prescribed in Table S 3.

8. When the deck planks are 6 inches in width or under, single fastening will be sufficient; but when they are above 6 inches and not exceeding 8 inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding 8 inches in width must be double fastened with nut and screw bolts.

9. The upper deck to be fastened by galvanised screw bolts with nuts at the under side of the angle bar of the beams and tie-plates. The bolts must be properly sunk, with oakum and white lead, under their heads, and be carefully covered over with turned dowels bedded in white lead, marine glue or some suitable composition.

10. Where diagonal plates are fitted on the beams, the deck planks to be scored over the diagonal plates, so as to fit close on the beams, thereby avoiding the use of wood pads.

11. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

STEEL DECKS. (See also Table S 5.)

12. Where steel decks are fitted $\frac{7}{20}$ of an inch in thickness and under, and no wood deck is laid on the same, beams of angle bar, or angle bulbs, of the sizes given in Table S 4, are to be fitted to every frame, except at the ends of the hatchways, where they are to be of bulb plate of the size required by the Rules for vessels of the same breadth having no steel deck. Where these angle bars or angle bulbs are fitted to every frame, a stringer is to be fitted at the middle line of the vessel to the under side of the beams formed of double angles of the reverse frame size or tee bars of equivalent section connected by short angle lugs to the under side of the beams, to admit of the pillars being riveted to the same. This stringer is to be connected by angle lugs to all deep beams and bulkheads which it abuts against. Or any other approved web may be fitted.

13. Where steel decks exceed $\frac{7}{20}$ of an inch in thickness bulb beams may be fitted to alternate frames in the usual manner, but steel angle or angle bulb beams to every frame, except at the ends of hatchways, are considered preferable. Where no wooden deck is to be laid on a steel deck, steel angle or angle bulb half-beams, of the size given in Table S 4, are to be fitted to every frame in the way of all hatchways, including those of engine and boiler openings.

14. When the deck plating is $\frac{7}{20}$ to $\frac{9}{20}$ of an inch in thickness amidships it may be reduced $\frac{1}{20}$ of an inch before and abaft the midship half length. When $\frac{10}{20}$ of an inch thick amidships it may be reduced $\frac{1}{20}$ of an inch for one-eighth the length before and abaft the half length amidships, and the remaining plates $\frac{2}{20}$ of an inch from the midship thickness.

15. Where a steel deck is required to be fitted by the rules, and is severed at the break, its continuity of strength is to be maintained by efficient brackets securely attached to the break bulkhead and to the deck plating before and abaft the same, or otherwise arranged to the satisfaction of the Surveyors.

16. If a wood flat be laid over an iron or steel upper deck, the thickness should not be less than 3 inches if of pine and $2\frac{1}{2}$ inches if of teak, and it should be efficiently secured between the beams to the

deck plating. Steel or iron decks are not to be reduced in thickness from that given by Table S 5, when sheathed with wood.

17. In all cases iron or steel decks, whether sheathed or not, are required to be caulked.

18. The butts of the steel deck to be double riveted for half the length amidships; and where large openings are cut in deck plating compensation is to be given for the same.

19. Where steel or iron decks are fitted, as required by the Rules, additional strength is to be applied in way of all hatchways, either by increasing the thickness of, or doubling the plating, or by fitting plates of the breadth and thickness required for tie-plates in Table S 5.

20. If a wood flat be laid over a steel or iron middle deck it may be $2\frac{1}{2}$ inches in thickness.

21. Where a vessel has a steel deck for half her length amidships, or beyond, but not a complete steel deck, or where there are one, two, or three steel decks; or one, two, or three steel decks, and in addition a partial steel deck, as before described, the same will be inserted in the Register Book thus—pt steel dk; 1 steel dk; 1 steel & pt steel dk; 2 steel dks; &c., &c., as the case may be.

22. Iron decks will be admitted in lieu of steel decks provided the thickness of the plating be in as many sixteenths of an inch as Table S 5 requires in twentieths for steel decks, when a notification of the same will be made in the Register Book, such as 1 iron deck, &c., as the case may be.

DOUBLE BOTTOMS.

Section 24. 1. Vessels fitted with a double bottom, for the purpose of water ballast, extending throughout the whole or part of the length of the vessel, will have the same denoted in the Register Book, together with its length and capacity. (*See* Key to Register Book.)

2. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms; but where partial double bottoms are fitted, these keelsons are to extend into or scarph the double bottom not less than three spaces of frames, and be connected to the longitudinal girders where practicable.

3. Manholes, with wrought iron or steel covers, must be constructed, or provision made for the removal of a portion of the plates so as to enable the inner surface of outside plating, the frames, floors keelsons, and rivets to be thoroughly examined and coated when required, and in way of the manholes in the inner bottom plating, doubling plates or rims should be fitted to receive the fastening of the covers. The double bottom to be made water-tight, and all water-tight joints to be tested on completion with a head of water at least equal to the extreme draught of water of the vessel.

4. Where deep water ballast tanks are fitted their water-tightness is to be tested by a head of water not less than 8 feet above the crown of the tank.

5. A wash plate to be fitted in the peaks when used for water ballast, and the tank to be subjected to the test of a head of water of 8 feet above the crown, but not less in any case than the height of the load water line.

6. All water-tight joints to have the surfaces of steel fitted close to each other and caulked, without, as far as practicable, the use of felt, canvas, &c.

7. The upper side of the plating must be protected with wood planking as ceiling, in no case to be less than $2\frac{1}{2}$ inches in thickness, the same to be laid on battens to admit of drainage water passing to the well.

8. Where a double bottom extends through the engine and boiler space, a well should be formed

between the engine-room after bulkhead and the floor immediately before the same, for the drainage of water, or open gutter ways of sufficient size should be made in the wings, so as to be always accessible.

9. The ceiling on double bottoms to be removed when the tanks are required by the rules to be tested.

10. It is of importance that ample provision should be made for the free passage of air from one division to another, so that it may readily find its way to the air pipes. This should be done by fitting the liners short, setting down the angle bar from the inner bottom or top of deep tank wherever necessary, and leaving, otherwise, a sufficient number of holes as near to the inner bottom as practicable. The air pipes should also be sufficient in number and size; and, wherever necessary, one should be fitted at each end of each tank on both sides of the vessel.

11. No class will be assigned to vessels having a double bottom, or part double bottom, unless such double bottom, or part double bottom, be constructed in accordance with the requirements of the Rules, or of strength equal to that prescribed thereby.

12. For record of double bottoms, &c., in the Register Book, see the Key to the Register in the Appendix to the Rules.

Double Bottoms formed with Girders on top of Ordinary Floors.

13. Where double bottoms are fitted with longitudinal girders extending on top of ordinary floors, the inner bottom must be efficiently constructed and made water-tight; the plating of it not to be less in thickness than given in Table S 7, and the girders spaced not more than 3 feet. The double bottom to be efficiently connected to the outside plating and frames of the main body of the vessel; and when reversed frames are cut, they must be compensated for by doubling the frames with short angle bars of their own size. The butts of the flange-plate to be double riveted; the butts and edges of the remaining plates may be single riveted. The brackets outside the margin plate to be fitted to every frame and extend up the bilges to at least the same height as required for ordinary floors.

14. Where double bottoms are fitted in the fore and after holds and not extended through the engine-room, great care should be taken to provide against an abrupt termination in the longitudinal girders; they are either to be carried through the engine-room, or fully compensated for by connection with the longitudinal engine and boiler bearers, or otherwise, to the satisfaction of the Surveyor. The longitudinal girders to have a continuous angle on the upper and lower edges, and, in addition, to be connected by angle lugs on the floors and girders.

15. Where double bottoms, or part double bottoms, are fitted with longitudinal girders on the floors, all the outside plating (except the garboard strakes) which is entirely within the boundary of them may be $\frac{1}{20}$ of an inch less in thickness than that prescribed in Table S 2, provided that thickness be $\frac{11}{20}$ of an inch, or above.

16. The height of the tank top above the floors to be sufficient for easy access and examination of the inside of tank.

Cellular Double Bottoms.

17. The scantlings, &c., of the various parts of the double bottom are to be as given in Table S 7.

18. In vessels whose plating number is 11,000 and under, triangular bracket plates of the thickness given in Table S 7 may be fitted at alternate frames; but under the engines, solid floor plates of the same

thickness, lightened by manholes, and with double angle bars on the upper edge, are to be fitted at every frame and at alternate frames under the boilers. Where the plating number exceeds 11,000 instead of bracket plates, solid floor plates lightened by manholes are to be fitted throughout the whole length of the double bottom. In all vessels where flat plate keels are adopted, and in vessels having hanging keels whose plating number is 18,000 and above, bracket plates are to be fitted to the centre girder at the intermediate frames, and where the plating number is 38,000 and under 51,000 the brackets at the centre girder and margin plate are to be of sufficient breadth at the top, to take three rivets in the vertical flange of the intermediate reversed angles, for $\frac{3}{5}$ the vessel's length amidships, and in all vessels bracket plates inside and outside the double bottom are to be fitted to the margin plate to every frame all fore and aft; and, where the plating number is 38,000 and above, the bracket plates outside the margin plate are to be connected to it by double angles, for one-half the vessel's length amidships. The brackets outside the margin plate to be fitted to every frame, and to extend up the bilges to the same height as required for ordinary floors. The vertical flange of the frame angles which are attached to the solid floors may be of the same size as the horizontal flange.

19. Intermediate angle bars are to be fitted for stiffening the inner bottom plating, unless the longitudinal girders are more closely spaced than given in Table S 7, and solid floors are fitted to alternate frames, when they may be dispensed with.

20. The keel should be formed by the vertical centre plate being extended down and riveted between two side bars, the three thicknesses to equal the thickness required for bar keels, or as otherwise approved.

21. The inner bottom plating to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and of the butts of the longitudinal girders, and the edges to be shifted well clear of the latter.

22. The butts and edges of the middle line strake all fore and aft, and also the butts of the inner bottom plating in the engine and boiler space, are in all cases to be double riveted. Where the plating number is 20,000 and under 30,000 the butts of the inner bottom plating are to be double riveted for half the vessel's length amidships. Where the plating number is 30,000 and under 38,000 the butts of the inner bottom plating, and the edges of an additional strake on each side of the middle line, are to be double riveted throughout. Where the plating is 38,000 and under 51,000 the remaining edges of the inner bottom plating are to be double riveted for one-half the vessel's length amidships.

23. The butts of the side girders and margin plates are to be double riveted; and in vessels whose plating number is under 21,000 the butts of the centre girder are to be connected by double butt-straps double riveted. When the plating number exceeds 21,000 the butts are to be treble riveted, with the alternate rivets in the back row omitted. The double butt-straps in all cases to be each not less than $\frac{3}{20}$ of an inch thicker than half the thickness of the plates they connect.

24. The rivets in the butts and edges of the inner bottom plating and in the butts of the girders are to be spaced not more than 4 diameters apart.

25. Manholes are not to be cut in the centre girder. The manholes in the floor plates, side girders, and inner bottom plating, are to be no larger and not more numerous than necessary to render all parts of the double bottom readily accessible. The edges of the manholes should be smooth to enable them to be entered with facility.

26. The bulkheads are to be connected to the inner bottom plating by double angle bars of the size required for the reversed frames, and to be caulked and made water-tight.

27. In this system of construction no reduction of thickness in the plating from the requirements of Table S 2 will be allowed where the floors are not spaced to every frame.

CELLULAR DOUBLE BOTTOMS HAVING CONTINUOUS FLOORS FROM CENTRE GIRDER TO MARGIN PLATES.

28. When double bottoms are constructed with solid floor plates, lightened with manholes, fitted to every frame, and continuous in one length from the middle line to the margin plate, the floor plates are to be connected to the centre keelson by double vertical angles of the size given in Table S 7 for half the length amidships where the plating number is 24,000 and above. Double vertical angles to be fitted in the engine and boiler space in all vessels. The scantlings are to be as given in Table S 7, and intercostal plates are to be fitted about midway between the centre girder and margin plate, and well connected to the floors and to the inner and outer bottom plating. In way of the engines additional intercostal girders are to be fitted, the number of girders to be as required by Table S 7.

29. In vessels where the breadth from margin plate to margin plate at inner bottom is 34 feet and does not exceed 44 feet, two intercostal side girders will be required.

30. In this system of construction the outside plating (except the garboard strakes and flat keel plates), which is entirely within the boundary of the double bottom, may be reduced as hitherto admitted in double bottoms with ordinary floors.

31. Any other plan of fitting double bottoms may be adopted, provided in the first instance it receives the approval of the Committee.

CEILING.

Section 25. 1. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed. From the upper part of the bilges upwards, either batten and space or close ceiling may be adopted, but the former is considered preferable.

2. The ceiling on the floors should be made in hatches where practicable, of convenient sizes, and when not so arranged, to be fastened to the reversed angle bars or frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

3. For thickness of ceiling, *see* Table S 3.

4. Vessels engaged *exclusively* in the coal trade will not be required to have cargo battens fitted.

ENGINE SPACE.

Section 26. 1. In steam vessels care must be taken that the engine and boiler bearers are properly constructed, having efficient longitudinal ties; and where the bearers may interfere with the longitudinal strength of the vessel, they must extend a sufficient distance beyond the bulkheads of the engine and boiler space to compensate for such interruption.

2. Where it is intended to fit engines of greater power than in ordinary cargo carrying steamers, the engine seating should be of proportionately greater strength, and be specially adapted with

this object in view by being connected to the sides of the vessel; and other means adopted to ensure greater rigidity and strength to withstand the extra vibration produced in this part of the vessel. The after floor-plates should also be extended well above the screw-shaft, and the after lengths of outside plating attached to the stern-frame should be of not less thickness than the plates in the same range amidships. Great care should be bestowed in ensuring sound riveting and workmanship at this part; the after frames should be sufficiently apart transversely to admit of this being affected.

3. As many *upper*, *middle*, and hold or lower-deck beams of extra strength, having double angles at upper and lower edges of the sizes as per Table S 4, are to be introduced in the engine and boiler space as may be practicable. (*See* Section 14, paragraph 32.)

4. In the engine and boiler space, double reversed angles must be fitted to every floor, from bilge to bilge, and from margin plate to margin plate in vessels having double bottoms; and in vessels where the number for plating is 15,000 and above (excepting in way of double bottoms), or the depth from the top of keel to top of hold beams is 17 feet or above, they are to extend sufficiently high to admit of the bilge stringer angles being riveted to them, unless the bilges are otherwise additionally strengthened by web-frames, beyond the requirements of the rules. Where the number is 16,000 and under 18,000, not less than three web-frames are to be fitted on each side, formed of plates of not less than the thickness of the frames, and of the breadth specified in Section 14a, and to scarph the ends of the floors, and extend to the upper or spar deck. Where the number is 18,000 and under 30,000 these web-frames are not to be more than from 8 to 10 feet apart, and where the number is 30,000 and above they are not to exceed 8 feet apart. The web-frames are to be fitted in way of the deck beams when practicable, and if fitted between the beams they are to be connected to the stringer plate by bracket knees above and below the same.

5. Where continuous bilge or side stringer bars pass through the web frames efficient compensation to be introduced in way of the same.

6. When hold beams are omitted in the engine and boiler space the web-frames are to be closer spaced than above described.

7. Where it is desired to adopt other plans than the foregoing for maintaining the necessary rigidity in the engine and boiler space, sketches of the same must be submitted for the approval of the Committee.

SHAFT TUNNEL.

8. The plating of shaft tunnels to be of the thickness required in Table S 1 for the lower half of bulkhead plating: the top plating in way of the hatchways to be not less than $\frac{2}{20}$ of an inch thicker than the remaining plates, or to be covered with wood not less than two inches thick. The tunnel to be additionally strengthened with transverse angle bars not more than 4 feet apart, and 3 feet in way of the hatchways, of the size of the reversed frames, and the plating to be caulked, and the tunnel to be tested with water to ensure its being water-tight. The recess bulkhead and the top plating to be strengthened and supported by similar angles, but spaced the same as the vessel's frames: the top plating where attached to the sides of the vessel to be made water-tight with steel or iron collars or chocks, to the exclusion of wood or cement. The tunnel to be fitted with a water-tight sluice door on the engine-room bulkhead, capable of being closed from the upper deck.

COCKS, VALVES, AND SOIL PIPES.

Section 27. 1. A sluice valve or cock is to be fitted at the limbers, to engine-room bulkheads, and also to after bulkheads when the after peak is not used as a water-ballast tank, to allow water to be shut off, or to reach the pumps when required. The same to be at all times accessible and to be fitted so as to be controlled above the load water-line, and to be boxed in to prevent injury. No sluice valve or cock is to be fitted to the collision bulkhead.

2. The shut-off valves or cocks of all openings for the inlet or outlet of water, in connection with the engines and boilers, are to be fitted close to the vessel's sides and are to be accessible at all times.

3. All head and stern pumps to be efficiently provided with stop-cocks to the satisfaction of the Surveyors.

4. Where soil pipes are attached to the outside plating below the load water-line, the lower length must be of steel or iron of substantial thickness, and be secured to the plating with a proper faced joint, and extended for some distance above the load water-line.

5. If the remainder of the pipe be of lead, care must be taken that it be of substantial thickness, and that it be properly protected externally with either zinc or iron, to the satisfaction of the Society's Surveyors.

HATCHWAYS AND MAST PARTNERS.

Section 28. 1. All hatchways are to be properly framed to receive half-beams where required, and the mast-holes to have partners at the upper deck and at the tier of beams where the masts are wedged, the plating of which is not to be less in thickness in any case than is required for stringer plates amidships, excepting in steamers where steel or iron decks are fitted, and the united breadths of the plates are not to be less than twice the diameter of the masts. At the decks where the masts are to be wedged, an angle bar, having the vertical flange not less than one inch deeper than required for the main frame of the ship, is to be fitted and riveted round the plate to the mast-holes.

2. A large angle bar is to be fitted on the beams where coamings are to be fitted, of sufficient size to compensate for double angles, the angle bar to be on the side of the beam that will be clear of the hatchway space. Plates are to be fitted and riveted to these beams, where necessary, in order that the ends of the deck may be properly fastened; and the coaming plates at sides of hatchways are to be connected to plates of the thickness required for tie-plates.

3. Where upper deck hatchways are 12 feet and not exceeding 16 feet in length, strong shifting beams are to be fitted, with proper means for firmly securing the same. Where the length is above 16 feet and not exceeding 20 feet, a deep web-plate is to be fitted between double angles, at the middle of the length, extending the depth of the coamings and carlings; and the fore and aft tie-plates in way of the same, and extending two spaces of beams beyond each end of the hatchway or opening, are to be double the width of that given in Table S 5, or such other arrangement as may be considered equal thereto may be adopted if approved by the Committee. When the length exceeds 20 feet a deck plan is to be submitted for the approval of the Committee, showing the necessary additional transverse strength proposed to be applied, by increasing the number of web-plates, and either increasing the width of the stringer and tie-plates or by plating the beams in way of the same, as the

case may require. Where steel or iron decks are fitted as required by the Rules, additional strength is to be applied in way of all hatchways either by increasing the thickness of, or doubling the plating, or by fitting plates of the breadth and thickness required for tie-plates in Table S 5.

4. All hatchway coamings on weather decks and the companions at the fore-end of steamers to be of steel or iron.

5. In all cases where half-beams are fitted, fore and aft carlings of the same size and description as the hatchway beams, are to be fitted in the hatchway spaces; the plates forming the coamings and head ledges are to be of sufficient strength in proportion to their size, and are to extend to the lower edge of the beams and carlings, and must be riveted to them, excepting that when the beams are of bulb plate they may then terminate on the bulb; where coaming plates are of extra thickness the carlings may be dispensed with. (*See* sketches at the end of Rules for Iron Vessels.)

6. Half beams are to be fitted to alternate frames where a wood deck is fitted, and to every frame under a steel or iron deck, between the hatchway beams, and their ends to be efficiently secured to the fore and aft carlings or coamings. In addition, fore and aft tie-plates are to be fitted close to the coamings and riveted to the beams and half-beams. An angle bar with its flange of sufficient depth to extend half an inch above the deck is to be fitted and riveted to the coamings and head ledge plates, and to the beams and tie-plates; its upper edge to be properly caulked, and the rivets used in its vertical flange to be countersunk and flush-headed.

7. In vessels having long hatchways for the purpose of "self trimming," wing boards are to be fitted to the approval of the Committee, to prevent the shifting of cargo.

8. The hatches of sailing vessels of 500 tons and above, and of all steamers, to be solid, not less than $2\frac{1}{2}$ to 3 inches in thickness.

ENGINE AND BOILER OPENINGS.

Section 29. 1. The engine and boiler openings of the weather deck of steam vessels are to be properly framed for a height of not less than 18 inches above the deck, the coaming plates to extend to the lower edge of the beams, and iron or steel trunk bulkheads connected to the coamings should be fitted to a height of about 7 feet above the deck; except in Awning and Partial Awning deck vessels where the height of the casing need not exceed 4 feet 6 inches above the deck, provided suitable iron covers be fitted, and the openings have coamings on the top of the casings not less than 9 inches in height; the thickness of the same, where exposed, to be not less than that required for the side plating of poops, and to be efficiently stiffened by vertical angles of the size of the reversed frames 30 inches apart, connected to the coaming plates. The thickness of the coamings to be $\frac{1}{16}$ of an inch more than required for the trunk bulkheads. Where the trunk bulkheads are enclosed by a complete bridge-house extending to the sides of the vessel, and efficiently protected from the force of the sea, a reduction from the above thickness might be admitted, provided in such cases a plan showing the proposed arrangement be furnished for approval. (*See* sketches at end of Rules for Iron Vessels.)

2. The engine and boiler openings in the 'tween decks of all vessels are also to be enclosed by trunk bulkheads efficiently stiffened by angle bars 30 inches apart, and extending to the weather deck beams, to which they are to be secured.

3. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least 18 inches above the deck, and efficient arrangements made for their security.

4. When a poop, or bridge-house, covers the engine and boiler space, the coamings of the engine and boiler openings should not be less than 2 feet above such deck, unless these openings are constructed as provided for in the first paragraph of this section.

5. It is considered that in all cases the engine and boiler openings should be made as small as practicable, and be subdivided by athwartship iron divisional casings to secure the maximum safety of the vessel. The two sides of the casing should in all instances be efficiently connected by angle beams within them at the upper part.

6. The engine-room skylights are to be in all cases substantially constructed and to be securely bolted or riveted to the coamings, and where the skylight top is not solid with bull's eyes fitted in the same, efficient deadlights of metal or wood must be provided. The grating openings over the stokehold must also be protected by plates, fitted with hinges, or otherwise in a manner satisfactory to the Surveyors.

7. Where either of the openings exceeds 15 feet, or the combined length exceeds 30 feet, the beams in way of the same are to be plated over from the stringer to the tie-plates, the plating extending two beam spaces beyond the openings, and tapered from thence towards the stringer plate for a distance not less than the breadth of the plating required to be fitted; the thickness of this plating to be the same as given in Table S 5 for steel decks.

8. Where large openings are adjacent to each other, the intervening space between the hatchways to be plated over.

COAL BUNKER PIPES AND LIDS.

Section 30. Coal bunker pipes, where practicable, are to be formed so as to be at least twelve inches above the upper deck, fitted with lids having studs to fit in openings made in the pipes, for their security; the pipes to be so formed that tarpaulin may be securely lashed over them. Where there are coal bunker hatches in the weather deck they must be properly framed with coaming plates of suitable height having solid hatches secured by an iron bar or other approved fastening.

PORTS AND SCUPPERS.

Section 31. 1. All vessels must be fitted with a sufficient number of ports and scuppers, to readily discharge any large quantity of water from the upper deck. The ports and flaps, where such are adopted, are to be hung by strong hinges with yellow metal pins, and the scuppers formed in the vertical flange of the upper deck stringer angle bar, which is to be increased in depth so as to enclose the scuppers; or any other equally efficient plan may be adopted.

2. Where the bulwark plating and main rail are cut through to form a cargo port, the bulwark stays at each end of the port should be of increased strength, to the satisfaction of the Surveyors.

3. A sufficient number of scuppers, with proper pipes attached to them, are to be fitted in all 'tween decks to convey water or leakage to the bilges.

4. In Well deck vessels, the freeing port area in the "Well" should be in accordance with the following Table :—

Length of Bulwarks in "Well," in feet.	Freeing Port Area on each side, in square feet.
30	9·5
35	10·0
40	10·5
45	11·0
50	11·5
55	12·0
60	12·5

65 and above, one square foot to each 5-ft. length of bulwarks.

VENTILATORS.

Section 32. It is recommended that ventilators, sufficient in number and size, be efficiently fitted to the upper deck of all vessels.

2. When scuttles are fitted for ventilation in the topsides of vessels, strong covers for them are to be provided ; these covers to be efficiently fitted, to the approval of the Surveyors.

3. Where scuttles are fitted in the sheerstake within three-fifths of the vessel's length amidships, compensation is to be given either by an extra thickness in the sheerstrake, doubling plate in way of the scuttles, or else by the introduction of strong angle bars over them.

CHAIN PLATES.

Section 33. The chain plates to be in proportion to the size of the vessel, and riveted efficiently to the outside plating (not bulwark plating), the sheerstrake being preferable.

BITTS.

Section 34. All bitts, when not of steel or iron, and which do not go down to the deck below, to be fitted into proper sockets fastened through the deck to plates riveted to the beams.

CEMENT.

Section 35. 1. The frames and plating of the bottom of all vessels to the upper parts of the bilges to be thickly and efficiently covered with Portland or other approved cement, which may be mixed with sand or other suitable substance. Care to be taken to have a proper substance of cement at its termination, and to keep the watercourses clear all fore and aft. The whole to be to the satisfaction of the Surveyors.

2. Where asphalte, enamel cement, or similar compositions are to be used, the same must be sanctioned by the Owners, and samples are to be submitted for the approval of the Committee.

3. The condition of such compositions is to be ascertained by the Society's Surveyors biennially, and vessels coated with compositions as above described will be distinguished with a record of "Asp." in the Register Book.

RUDDER.

Section 36. 1. The rudder to be made to ship and unship while the vessel is afloat. The size of mainpiece, given in Table S 3, to be regulated by the number which regulates the thickness of the vessel's plating; it is to be of the best hammered iron or steel. In cases where the rudder is exceptionally large, or where the vessel is built to attain a high speed, the diameter of the rudder head should be increased beyond that given in Table S 3. It is also recommended that the stops on the steam steering engines should be fitted at a smaller angle than the stops on the rudder, in order to prevent excessive strain through the rudder being forced against the stops. The frame of the rudder and main piece to be one forging; the rudder to be stayed at intervals corresponding with the pintles. (*See* also Section 42, paragraph 16). The plating to be of the thickness given in Table S 1 for the lower half of bulkheads, and where practicable these plates should be in one length. The plates to be countersunk, and the rivets to have full heads and points. It is recommended that the pintles be made independent of the frame. They should be spaced not more than from 4 feet to 5 feet 6 inches, and the upper one should be placed as near as practicable to the rudder trunk, and the rudder plates should be secured to the frame with rivets of not less size than required for the upper edge of the garboard strake amidships, and spaced not more than five diameters from centre to centre. All vessels to have a spare tiller and gear ready for use if required.

2. Solid cast steel rudders of approved manufacture, and satisfactorily tested, and single plate rudders will be admitted, if the particulars be, in the first instance, submitted to, and approved by, the Committee.

3. The tests of cast steel rudders to be as follows :—A tensile test is to be made on a piece taken from each casting, and the extension on a length of 8 inches is not to be less than 8 per cent., and the tensile strength not less than 28 tons, nor more than about 35 tons per square inch. A cold bending test also to be made corresponding to each tensile test, and the sample to bend cold before fracture through an angle of at least 90°.

The rudders to be dropped from a height of from 7 to 10 feet, according to the design, shape, and weight of the casting. The casting in each case to be subsequently slung up and well hammered with a sledge hammer, not less in weight than 7 lbs., to satisfy the Surveyors that the castings are sound and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

WINDLASS AND HAWSE-PIPES.

Section 37. 1. The windlass, for all grades, if of wood, may be composed of any of the following timbers; namely, English, African, or Live Oak; Adriatic, Italian, Spanish, Portuguese or French Oak; East India Teak, Morung Saul, Greenheart, Morra, or Iron Bark. The iron or steel spindle in all cases to pass through the body of the windlass.

2. The hawse-pipes must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass or capstan.

PUMPS.

Section 38. 1. In Steam Vessels the pumping arrangements according to the division of holds &c., to be as follows :—

2. **Holds with double bottoms.**—In the double bottom of each compartment of the hold and of

engine and boiler space, a steam pump suction is to be fitted at the middle line, and one on each side to clear the tanks of water when the vessel has a heavy list. Where there is considerable rise of floor towards the ends of vessels, the middle line suction only will be required. A steam pump suction and a hand pump are also to be fitted to each bilge in each hold where there is no well. When there is a well, one or three steam pump suctions are to be fitted in the same according as there is considerable or little rise of floor, and hand pumps fitted at the bilges.

3. **Holds without double bottoms.**—Where there is considerable rise of floor, one steam pump suction and one hand pump are to be fitted in each hold. In vessels with little rise of floor, two or three steam pump suctions and at least one hand pump to be fitted to each hold.

4. **Engine and boiler space.**—Where a double bottom extends the whole length of engine and boiler space, two steam pump suctions are to be fitted to the bilge on each side. Where there is a well one steam pump suction should be fitted in each bilge and one in the well. Where there is no double bottom in the machinery space, centre and wing steam pump suction should be fitted. The rose box of the bilge injection is to be fitted where easily accessible, and is to be used for bilge water only. The main and donkey pumps to draw from all compartments, and the donkey to have also a separate bilge suction in the engine room.

5. **Fore and After Peaks.**—If the Peaks are fitted as water ballast tanks, a separate steam pump suction is to be led to each. If not used for water ballast, an efficient pump is to be fitted in the fore peak.

6. **Tunnel.**—The tunnel well is to be cleared by a steam pump suction.

7. **All Hand Pumps** to be capable of being worked from the upper or main decks above the deep load water line.

8. **No Sluice Valves** are to be fitted which are not at all times accessible.

9. **Sounding Pipes** to be fitted on each side of holds and ballast tanks, and a doubling plate is to be fitted under each.

10. **Air Pipes** to be fitted to each ballast tank as required.

11. In addition to the engine pumps in steam vessels, an efficient pump is to be fitted in the bilges, on each side of the vessel, to each cargo compartment, for clearing the bilges of water when the vessel has a list, and to be capable of being worked from the upper or main deck; or such other arrangement may be adopted as may, when submitted to the Committee for their approval, be deemed satisfactory by them. An efficient pump is to be fitted in the forepeak. A doubling plate should be fitted under all sounding pipes.

12. All **Cocks** and **Valves** in connection with bilge and ballast suction pipes are to be fitted in places where they are at all times accessible.

13. The **Pipes** for bilge or ballast suctions are to be fitted with flanged joints in convenient lengths, so that they may be easily disconnected for clearing. In the case of cast iron suction pipes, which are not also used as tank filling pipes, or which cannot be subjected to sea pressure, spigot and faucet joints made with india-rubber rings fitted over the spigots might be adopted, except in the case of bilge suction pipes passing through ballast tanks, which should be fitted with flanged joints.

14. The **Suction Pipes** to fore and aft peaks, and to the tunnel well, should not be less than $2\frac{1}{4}$ inches inside diameter, except in vessels under 500 tons under deck, in which case they may be made 2 inches.

15. The **Bilge Injection** should not be less than two-thirds of the diameter of the sea inlet to the circulating pump.

The inside diameter of other bilge suction pipes should not be less than given in the following Table :—

Tonnage under Upper Deck.	Engine Room Centre Suction, Separate Donkey Suction, and Hold Centre Suctions.	Wing Suctions in Holds where no Centre Suctions are fitted, and Wing Suctions in Engine Room.	Wing Suctions in Holds where Centre Suctions are also fitted.
	Inches.	Inches.	Inches.
In vessels under 500 tons	2	2	2
„ 500 tons but under 1000 tons ...	$2\frac{1}{4}$	2	2
„ 1000 „ „ 1500 „ ...	$2\frac{1}{2}$	$2\frac{1}{4}$	2
„ 1500 „ „ 2000 „ ...	3	$2\frac{3}{4}$	$2\frac{1}{4}$
„ 2000 „ „ 3000 „ ...	$3\frac{1}{2}$	3	$2\frac{1}{2}$
„ 3000 tons and above	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{4}$

In cases where more than one suction to any one compartment are connected to the pumps by a single pipe, this pipe should be not less than the size required for the centre suction.

EQUIPMENT.

Section 39. 1. All vessels are required to have their masts, spars, and rigging in good order, and sails in sufficient number and in good condition.

2. Every ship is to be provided with anchors, cables, &c., of approved quality, tested at a *public machine* recognised by the Committee, in number and length as set forth in Table No. 22. (*See* after page 151).

3. To entitle vessels classed A "For Channel Purposes" to the Figure 1, the equipment of Anchors and Chain Cables, &c., should be as required by Table 22, with the exception that not more than two bower anchors need be supplied, the first bower being of the greatest weight given in the Table, and the second bower 15 per cent. lighter, the stream anchor only being required.

4. In vessels, however, engaged for more extended voyages, such as the Queenboro' and Flushing service, or the Channel Islands or Irish Sea, the equipment must be in accordance with the requirements of Table 22.

5. In cases, however, where anchors and chain cables are manufactured abroad and supplied to *foreign owned vessels*, and testing certificates are furnished setting forth that the anchors and chain cables have been tested at a Government machine, or a machine under the control of a municipal body, or a similar responsible body, such certificates will be accepted as complying with the requirements of the Rules for obtaining the Figure 1, provided the remaining requirements of Table 22 be complied with, but in these cases the record of A.&C.P. will not be made in the Register Book.

6. A certificate of all chains and anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the Figure 1.

7. The equipment as regards anchors, chains, warps, &c., is to be regulated by the number produced by the sum of the measurements in feet arising from the addition of the half moulded breadth of the vessel at the middle of the length, the depth from the upper part of the keel to the top of the upper deck beams, with the normal round up, and the girth of the half-midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate, multiplied by the length of the vessel for a one, two, and three-decked vessel, and for a spar-decked vessel. For a vessel having a complete awning-deck, or a continuous shade deck, the equipment number is to be increased one-eighth beyond that given by the measurements defined above to the main deck.

8. For a steam vessel with a partial awning-deck, poop, top-gallant forecastle, bridge-house or a raised quarter-deck, the equipment number is to be increased beyond that for a flush or spar-decked vessel by that proportion of the addition made for a complete awning-deck which the combined length of the erections bears to the length of the vessel.

9. All vessels under 150 tons to be provided with one good boat ; and every vessel of 150 tons, and above, to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels.

10. **Anchor Cranes** and **Boats' Davits** to be in accordance with Table 12, at end of the Rules for Iron Vessels.

11. In steam vessels, the boilers and machinery are to be considered as part of the equipment, and unless the Surveyors are satisfied of their efficiency the Figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting, a class to which the hull of a vessel may be found entitled will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules.

12. The efficient state and condition of the whole of the ship's equipment will be designated by the Figure 1 ; and where the same is found insufficient in quantity or defective in quality, by a dash thus — following the character assigned to the ship.

DEFECTIVE EQUIPMENT.

13. In the case of a steam vessel already classed of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the Figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the Figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel in the Register Book ; but where, in the opinion of the Committee, the machinery or boilers are deemed so far inefficient or defective as to imperil the vessel's safety, the Figure 1 will be withheld, and a red ring inserted in place thereof ; and in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the Figure 1 for equipment, as described in the Key to the Register Book.

REPORTS ON VESSELS.

Section 40. 1. The Surveyors, in submitting their Reports of vessels not already classed, are in all cases, where practicable, to forward a sketch of the midship section, and other drawings where necessary, to be furnished by the builders, with figured dimensions of the component parts marked thereon.

2. Builders wishing to adopt plans other than those described herein, are to submit them through the Resident Surveyors (who are to state their opinions thereon) for the Committee's consideration and approval.

"THREE-DECK" STEAM VESSELS.

Section 41. Steam vessels not less than 17 feet depth from top of keel to the middle deck, having two or more complete decks laid and caulked, and a tier of hold beams, or extra strong beams, or web-frames and stringers in lieu thereof, will have their scantlings determined as follows:—Such vessels to be denoted in the Register Book, "3Dks," or "2Dks3trB.," or "2Dks&web frames," as the case may be.

2. The scantlings and spacing of the frames, reversed frames and floor-plates, the thickness of bulkheads, and diameter of pillars, are determined by the number produced by the deduction of *seven feet* from the sum of the measurements in feet arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the *upper deck beams*, with the normal round-up, at the middle of the vessel's length, and the girth of the half-midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate.

3. The scantlings of the keel, stem, sternpost; the thickness of the outside plating, keelson and stringer plates, and deck; also the scantlings of the angle bars on beam stringer plates, and keelson and stringer angles in hold, as in Tables S 2, S 3, and S 5, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

4. All the frames are to extend to the upper deck stringer plate.

5. The reversed frames are to extend to the upper part of the middle deck beam stringer angle, and to the upper part of the frames alternately.

6. The plating to be of the thickness given in Table S 2, from the keel to the gunwale; the sheerstrake to be placed at the gunwale, and the strake of plating in way of the middle deck to be an outside strake.

7. The upper and middle deck stringer plates to be of the breadth and thickness prescribed in Table S 5. The middle deck stringer plate to be fitted and connected to the outside plating by angles between the frames of the size given for beam stringer angles; and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angles on each frame, and to the stringer plate, the space between this angle bar and the outside plating, all fore and aft, to be filled in and made water-tight. Similar angle bars are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck stringer.

8. The butt-straps of the sheerstrake and upper and middle deck stringer plates, and of not less than three strakes of plating at the bilge to be treble riveted, for not less than half the vessel's length amidships, and otherwise as per Section 20.

9. In these vessels a side intercostal keelson is to be fitted and attached to the outside plating by angle bars of not less size than $3 \times 3 \times \frac{8}{20}$; but if the plating number is 21,700 and under 30,400, these

angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$; if of this number and above, they are to be not less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

10. The thickness of the flat of upper deck is to be as given in Table S 3. In all cases a middle deck is to be properly laid and caulked, the thickness of which may be one half inch less than that prescribed for the upper deck.

11. Engine-room hatchways on the middle deck are to be enclosed by steel or iron trunk bulkheads, efficiently strengthened, and extended from the middle deck to the upper deck, as prescribed in Sec. 29.

12. If in such vessels the length exceeds *eleven* times the depth taken from the *upper part of the keel* to the top of the *middle deck beams*, additional strength will be required at the bilge and bottom, as per Table S 6; but no additional strength at the sheerstrake and stringer plate will be needed until the length exceeds *eleven* times the depth taken from *the upper part of the keel* to the top of the *upper deck beams*; when this is the case, additional strength will be required in the *upper deck* sheerstrakes and stringers, as per Table S 6 relating to vessels' proportions.

SPAR-DECKED STEAM VESSELS.

Section 42. 1. Vessels noted in the Register Book as "Spar-deck" are those which are of lighter construction* than vessels built under the "Three deck" rule having the same dimensions, taken with reference to the total depth of the spar or upper deck in either case.

2. They must have three tiers of beams and be not less than 17 feet depth from top of keel to the main deck. The Committee, however, will approve of the construction of Spar-deck vessels having a somewhat less depth of hold provided the plans be in the first instance submitted for approval. For such vessels having less than 17 feet depth from top of keel to the main deck, a minimum freeboard must also be submitted to the Committee for approval, and the freeboard sanctioned is to be inserted in the Certificate and in the Register Book, and marked on the ship's sides.

3. In cases where erections are required on the spar deck, plans must be submitted showing the additional strengthening proposed, which must be to the satisfaction of the Committee.

4. In such vessels the scantlings and arrangements are to be regulated by the dimensions under the main deck, as in those having one or two decks.†

5. *All* the frames must extend to the spar-deck stringer plate.

6. The reversed angle bars on the frames are to extend to the upper part of the main deck beam stringer angle, and to the upper part of the frames, alternately.

7. The main and spar deck sheerstrakes, and the plating between them, to be in thickness as prescribed in Table S 2. The riveting of the butts of the plating between these sheerstraks to be regulated by Section 19, paragraph 11, and Section 20.

8. A reduction of $\frac{1}{20}$ of an inch from the thickness required by the upper line of Table S 5 for stringer and tie-plates will be allowed for those of the spar deck.

9. The butt-straps of the spar and main deck sheerstrakes and stringer plates, and of not less than

* This does not necessarily imply that the vessel is of less strength in relation to the amount of dead-weight carried at a suitable load-line.

† Where the height between the main and spar-deck stringers at the sides is 8 feet or above at any part, additional transverse strength will be required to the satisfaction of the Committee.

three strakes of plating at the bilges, to be treble riveted for at least half the vessel's length amidships, and otherwise as per Section 20.

10. In these vessels a side intercostal keelson is to be fitted and attached to the outside plating by angle bars of not less than $3 \times 3 \times \frac{8}{20}$; but if the plating number is 21,700 and under 30,400 these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$; if of this number and above, they are to be not less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

11. The lower edge of the main sheerstrake must not be more than one-half its depth below the main-deck stringer plate.

12. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle bars between the frames, of the size given for beam stringer angle bars, and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angle bars on each frame, and to the stringer plate ; the space between this angle bar and the sheerstrake, all fore and aft, to be filled in and made water-tight. Similar angle bars are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck.

13. These vessels are to have a complete main deck $3\frac{1}{2}$ inches in thickness, laid and caulked.

14. The flat of spar deck to be not less than $3\frac{1}{2}$ inches in thickness.

15. Engine-room hatchways on the main deck are to be enclosed by steel or iron trunk bulkheads, efficiently strengthened and extended from the main deck to the spar deck. (*See* Section 29.)

16. The diameters of rudder head and pintles to be regulated by the number which regulates the plating of a three deck vessel of the same dimensions. (*See also* Section 36.)

17. The measurement of depth, for regulating the additional strength required for vessels of extreme proportions, is to be taken from the upper part of keel to the top of the *main deck beams.*

18. When Table S 6 applies to these vessels, the increased strength defined for sheerstrakes is tc be added to those of either the spar or main deck.

19. They are to have extra strength at the bilge and bottom in the proportion of their length to depth from main deck as prescribed in Table S 6 ; they may, however, be 13 and under 14 depths in length before they are required to have the remaining extra strength prescribed for vessels of 11 to 12 depths in length, and such vessels exceeding the above proportions to have extra strength in the same relation to that prescribed for one and two-decked vessels.

20. Vessels to which this rule applies will be noted in the Register Book thus :—"*Spar dk.*"

AWNING DECKED STEAM VESSELS.

Section 43. 1. An awning-decked vessel is one having a comparatively light superstructure fore and aft on the main deck proper of the vessel, intended to shelter passengers or cattle, or for the conveyance of cargo either light in its nature or limited in quantity. In such vessels the scantlings and arrangements of the frames, reversed frames, the thickness of bulkheads, and diameter of pillars in Table S 1, are to be regulated by the dimensions under the main deck, as in a one or two-deck vessel, exclusive of the awning-deck.

It is a condition on which an awning-decked vessel is classed in the Society's Register Book that the freeboard assigned shall be marked on the vessel's sides as hereafter described. If the vessel be loaded to a

greater draught of water than that assigned by the Committee, or if the mark indicating the maximum load draught be placed higher than the position assigned by the Committee, the vessel will thereby forfeit her character in the Register Book.

2. The plans of such vessels and a minimum freeboard must be submitted to the Committee for approval, and the freeboard thus sanctioned is to be inserted in the Certificate and in the Register Book, and marked on the ship's sides.*

3. Awning-decked vessels loading to a greater draught of water than thus indicated will thereby lose their character in the Register Book.

In the case of an awning-decked vessel which for any reason has forfeited her character, the freeboard assigned as a condition of classification will be omitted in reprinting the Register Book, unless the character be previously reinstated.

4. Vessels to which this rule applies, as regards an entire awning deck, will be noted in the Register Book thus, "*Awng dk.*"

5. Such erections only as are necessary for navigating these vessels will be allowed on the awning deck, unless plans are submitted to, and approved by, the Committee.

6. All the main frames must extend to the awning-deck stringer plate, or to the lower part of the curve when of a rounded form at the gunwale. To be of the size given in Table S 1, but in no case to be less than $3\frac{1}{2} \times 3 \times \frac{6}{20}$.

7. The whole of the reversed frames are to be extended to the top of the main-deck stringer angle bar.

8. All the side plating above the main sheerstrake to be not less than as given in Table S 2.

9. The awning-deck stringer plate to be of the breadth given in Table S 5 for hold beam stringers, and of the following thicknesses, namely :—

In vessels whose plating number is under 13,000, not less than $\frac{6}{20}$ of an inch.
„ 13,000 and under 18,000, „ $\frac{7}{20}$ „
„ 18,000 „ 24,000, „ $\frac{8}{20}$ „
„ 24,000 „ 31,000, „ $\frac{9}{20}$ „

When the number for plating exceeds 31,000, or the vessel exceeds thirteen depths in length to the main deck, special arrangements must be made for affording the requisite longitudinal strength at the gunwale to the satisfaction of the Committee.

10. The tie-plates to be of the same thickness as given above for the stringer plates, and to be in breadth as in Table S 5 for main deck tie-plates.

11. The butts of the awning-deck side plating above the main deck, and of the awning-deck stringer and tie plates, are to be double riveted.

12. A reduction of one-fourth from the thickness prescribed for the main deck will be allowed for the flat of awning-deck.

13. The beams to be of the sizes given in Table S 4. They are to be placed at every alternate frame, and, if the vessel is of a rounded form at the gunwale, to scarph the main frames not less than eighteen inches, and to be properly riveted to them. For diameters of pillars *see* Table S 1.

* See Notice of Freeboard requirements printed at end of Rules.

14. These vessels are to have a complete main deck laid and caulked, and coamings and hatches fitted as to a weather deck.

15. Engine-room hatchways on the main deck are to be enclosed by steel or iron trunk bulkheads, efficiently strengthened and extended from the main deck to the awning-deck. (*See* Section 29.)

16. Rounded gunwale plating to be not less in thickness than required for the awning-deck stringer plate, and to have a gunwale angle bar of the size required by Table S 3.

17. The gunwale must be properly constructed to the satisfaction of the Surveyors.

18. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle bars between the frames, of the size given for beam stringer angles; and, in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angles on each frame, and to the stringer plate; the space between this angle bar and the sheerstrake, all fore and aft, to be filled in and made water-tight.

POOPS, FORECASTLES, AND BRIDGE-HOUSES.

Section 44. 1. In full poops, forecastles, and bridge-houses, a reduction of one-fourth from the dimensions which would be required in the same range if the vessel were flush-decked (exclusive of additions for extreme proportions) will be allowed in the outside plating, stringer and tie-plates upon beams, angle bars or stringer plates, and flat of deck. The side plating need not exceed the thickness required for awning-decked vessels. The butts to be double riveted.

2. All frames to extend to the poop or forecastle stringer plate, or to the lower part of the curve when of a rounded form at the gunwale, and a continuous angle bar of the size given for the lower deck stringer angle is to be wrought on the upper deck stringer plate inside the frames, as prescribed in Section 16, paragraph 7. The beams to be of the size given in Table S 4, and they are to be efficiently pillared. A beam to be placed at every alternate frame to scarph the main frames not less than eighteen inches, and to be properly riveted to them.

3. The rounded gunwale plating may be of the thickness required for the poop or forecastle stringer plates. The gunwale must be properly constructed to the satisfaction of the Surveyors.

4. Bulkheads at the fore end of long poops and long bridge houses to be of the thickness of their side plating, with coaming plates $\frac{1}{20}$ of an inch thicker than their bulkheads, and to be stiffened with bulb plates of not less size than those required for forecastle beams, and angles of the size required for the vessel's reverse frames, spaced 30 inches apart, and connected both to the coaming plates and to the deck plating, or to an athwartship plate on the beams both below and above, with a bracket-plate to each end of the bulb stiffener; or other equivalent strength introduced.

5. Bulkheads at the fore end of short poops and bridge houses to be of the thickness of their side plating, with coaming plates $\frac{1}{20}$ of an inch thicker, and to be stiffened with angle bars the size of the frames spaced 30 inches apart.

6. The bulwark plating at the fore and after ends of the bridge to be increased in thickness and supported by bracket knees, and the freeing ports at this part should, in order to preserve a continuity of strength, have rounded corners and a substantial rim.

7. Where the poop exceeds one-fourth of the vessel's length, the sheerstrake is to be doubled, and

the upper deck stringer plate increased in thickness in way of the break, for a length of from 20 to 30 feet, at this part, to the satisfaction of the Surveyors.

8. In top-gallant forecastles of vessels whose plating number is 18,000 and above, the alternate reversed frames are to extend to the forecastle deck, or a double angle stringer of the size required for reversed frames is to be fitted inside the frames midway between the upper and forecastle decks, connected at the fore-end by an efficient breasthook ; or other equally efficient means of strengthening the forecastle may be adopted if approved by the Committee.

9. Where it is proposed to fit a poop or top-gallant forecastle to a vessel under 14 feet depth of hold, the plans are to be submitted for the consideration of the Committee.

10. Where bridge-houses are fitted, the whole of the frames are to be extended to the height of the bridge-deck, or be connected to the stringer plates by knees and bracket-plates, and the gunwale angle bar made continuous. Where efficient partial bulkheads are fitted, the alternate frames only need extend to the height of the bridge-deck. When the frames are extended through the upper deck stringer plate there must be a continuous angle bar of the size given for lower deck stringer angles, wrought on the upper deck stringer plate, inside the frames.

11. Where the combined length of the poop, or raised quarter deck, and bridge-house exceeds two-fifths the vessel's length, and the plating number is 15,000 and above, the sheerstrake should be doubled for one-half the vessel's length amidships, or other equivalent strength should be added to the satisfaction of the Committee.

12. This additional strengthening to be given also to vessels of over 11 depths in length and whose plating number is 15,000 and above, where a bridge-house is fitted of a length equal to or exceeding one-fifth the length of the vessel.

13. The doubling to the sheerstrake required by paragraph 11 may be dispensed with in vessels having bridge-houses not less than two-fifths the length of the vessel, provided the bridge side plating be increased in thickness, and the upper strake treble riveted with buttstraps $\frac{1}{20}$ of an inch thicker than the plates, the bridge stringer plates be increased in breadth and thickness, a $\frac{5}{16}$ iron or $\frac{6}{20}$ steel bridge-deck be fitted, the landing edges of bridge side plating be double riveted and the main sheerstrake be doubled at the ends of the bridge house with plates 18 to 20 feet long. The thickness of bridge side plating and stringer plates to be as follows, and the bridge stringer angles of the size required for lower deck stringer angles :—

Plating numbers.	Bridge Sheerstrake.	Bridge Side plating.	Bridge Stringer plates.
Under 15,000	36 × $\frac{8}{20}$	$\frac{8}{20}$	36 × $\frac{8}{20}$
15,000 to 18,000	36 × $\frac{9}{20}$	$\frac{8}{20}$	36 × $\frac{8}{20}$
18,000 to 21,000	36 × $\frac{10}{20}$	$\frac{9}{20}$	38 × $\frac{9}{20}$
21,000 to 24,000	36 × $\frac{10}{20}$	$\frac{9}{20}$	40 × $\frac{10}{20}$
24,000 to 27,000	36 × $\frac{11}{20}$	$\frac{9}{20}$	40 × $\frac{10}{20}$

RAISED QUARTER-DECKS AND SUNK FORECASTLES. (*See Sketches at end of Rules.*)

Section 45 1. Side plating of raised quarter-decks and sunk forecastles may be $\frac{1}{20}$ of an inch less in thickness than topside plating below it if the topside plating be $\frac{7}{20}$ of an inch in thickness or more.

2. The frames in all cases, and the reversed angles on alternate frames, are to extend to the raised quarter-deck and forecastle stringer plate.

3. The upper deck sheerstrake is to extend to the stern. The front or break bulkhead of the raised quarter-deck is to be stiffened by an athwartship plate, of not less size than the upper deck beam tie-plates, and efficiently connected to it by angle bars; this athwartship plate is to receive the deck ends, and is to be supported by bracket plates when not riveted to a beam.

4. The number and arrangement of hold beams, beam stringers, and stringers in hold, in way of raised quarter-decks, must be in accordance with the Rules for the increased depth of the vessel, and the height of the reversed angles on the frames is to be regulated by the number for scantlings which the increased depth would give. The main sheerstrake to be doubled for a reasonable distance before and abaft the brake. Where, however, the raised quarter-deck is connected to a bridge-house, it is preferred that in lieu of this, the raised quarter-deck side plating should be doubled at the break for the same length. Should the raised quarter-deck side plating not be doubled, it must be increased in thickness at the break, in addition to the sheerstrake being doubled. The bulwark plate of the raised quarter-deck adjoining the bridge side plating to be increased in thickness, and the sheerstrake doubled at front of bridge. The butts of the side plating and stringers at these parts to be carefully arranged, and the butts of the raised quarter-deck side plating, main sheerstrake, and the strake of plating next below, are to be treble riveted in the neighbourhood of the break, and the butt-straps increased in thickness. The main deck stringer plate is to extend abaft the break about seven frame spaces and the raised quarter-deck stringer plate about four frame spaces before the break and the stringer plates below the main deck are to have a shift of about 16 feet overlap; the bridge stringer also is to extend abaft the break. *The size of beams of raised quarter-decks to be regulated as prescribed in Table S 4.*

5. In such vessels, of extreme proportions requiring by Table S 5 a steel deck, or part steel deck, where the raised quarter-deck is of considerable length, the main deck plating is to scarph the raised quarter-deck for a length of two to three frame spaces according to the size and proportions of the vessel. There are to be from four to five diaphragm plates of the thickness of the main deck plating, connecting the two decks, and attached to the bulkhead and decks by double angles and stiffened by an angle on the after edges. The raised quarter-deck side plating is to be doubled at this part for a length of 18 to 20 feet.

6. Web plates not less than 15 inches deep to be fitted on the fore side of the bulkhead in way of the diaphragm plates, efficiently bracketed to the main and bridge deck plating.

7. Where the plating number is 24,000 and under 26,000, the main and raised quarter decks are to be scarphed four frame spaces, and where the plating number is 26,000 and above, five frame spaces. The webs on the fore side of the break bulkhead are to be not less than 18 inches deep. In such vessels the raised quarter-deck side plating is to be doubled, commencing at one-fourth the length of the vessel from the stern and extending to 8 feet beyond the break of the raised quarter-deck.

8. The break bulkhead to be of the thickness of the bridge side plating, and stiffened with angles of the size of the frames spaced 30 inches apart.

9. Where the plating number exceeds 20,000, or the vessel is over 13 depths to length, the break bulkhead is to be not less than four frame spaces abaft the after end of the engine room opening.

10. Vessels which from their size and proportions do not require the decks to be scarphed, are to have from four to five bracket knees fitted on each side of the break bulkhead, the thickness of which is not to be less than that of the main deck plating.

11. The raised quarter-deck plating should be attached to the break bulkhead by double angles of not less size than that given in Table S 3 for middle deck stringer angles.

12. Where the combined length of the poop or raised quarter-deck and bridge-house exceeds two-fifths the vessel's length, and the plating number is 15,000 and above, the sheerstrake to be doubled for one half the vessel's length amidships, or other equivalent strength added, to the satisfaction of the Committee.

VESSELS OF EXTREME PROPORTIONS.

Section 46. 1. Additional longitudinal strength, beyond that stated in the foregoing rules, and in Tables S 2, S 3, and S 5, will be required for vessels of extreme proportions, as shown in Table S 6.

2. *The length, breadth, and depth to be taken as per Section 1.*

3. For all vessels exceeding in length sixteen depths to the middle deck*, plans must be submitted for the approval of the Committee for giving the vessels sufficient additional strength longitudinally; and all vessels having a length of thirteen depths and above to the upper deck, are to have a substantial erection extending over the midship half length of the vessel.

4. In all cases where keelsons, or other additions, are required for a certain portion of the length of a vessel, care should be taken to avoid any abrupt termination of this additional strength by tapering the keelsons, &c., beyond these limits, and properly shifting their terminations.

*All vessels, excepting those with an awning deck, whose plating number exceeds 35,000 and exceeding 16 depths in length, taken from the main deck, are to have the whole of the reversed frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-decked vessels, they are all to extend to the main deck.

RULES

FOR THE

SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 47. 1. In steam vessels, the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them in the manner shown in form No. 8 annexed. If found satisfactory, the Committee will thereupon grant a certificate, and insert in the Register Book the notification, "LMC" *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

2. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

3. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus : "✠LMC," or "✠NE & B," or "✠NB."

4. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined and from them the working pressure fixed.

5. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam ; any defects, &c., to be pointed out as early as possible.

6. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

7. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 40.)

8. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

9. The boilers, together with the machinery, to be inspected at different stages of construction.

10. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

11. Two safety valves to be fitted to each boiler, and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60 lbs. per square inch, the safety valves may be loaded to 5 lbs. above the working pressure. If common valves are used their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case to exceed 10 per cent. of the working pressure.

12. An approved safety valve also to be fitted to the super-heater.

13. In winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

14. Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers and be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

15. Stop-valves to be fitted so that each boiler can be worked separately.

16. Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

17. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside plating.

18. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

STEEL BOILERS.

19. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*See* Circular, No. 438*, page 146) :—

1. The material of stays and of plates is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.

In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*

It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red, and quenched in water of 82° Fahrenheit.

2. Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test they must be capable of withstanding the same tests as the plates are required to undergo.
3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.
4. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.
5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.
6. No steel stays are to be welded.
7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

20. The engines are to be fitted with two feed-pumps, each capable of supplying the boilers; the pumps, &c., to be so arranged that either can be overhauled whilst the other is at work.

21. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

22. In engines of 70 H.P. and under, one feed-pump and one bilge-pump will be deemed sufficient, provided they are of adequate capacity.

The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators for controlling their speed. If only one such pump is fitted for the main feed, the auxiliary feed pump required by paragraph 25 should also be fitted with an automatic speed regulator.

23. A bilge injection, or a bilge suction to the circulating pump, is to be fitted.

24. The engine bilge-pumps are to be fitted capable of pumping from each compartment of the vessel. The mud boxes and roses in engine room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

25. A steam pump is to be provided capable of supplying the boilers with water; this pump to be provided with suctions to the hotwell and also to the sea. A steam pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine room it

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

must be fitted to be worked by hand. In small vessels in which only one steam pump is fitted, it must comply with all the requirements.

26. In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes, and all main steam pipes are to be tested by hydraulic pressure to twice the working pressure, in the presence of the Engineer Surveyor.

27. All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge valves fitted on the plating of the vessel in an accessible position.

28. No pipes are to be carried through the bunkers without being properly protected.

29. Bilge suction-pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

30. All shafts are to be examined when rough turned and finished.

31. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, see the formula in paragraph 41.

STEEL CASTINGS.

32. **Steel Castings** may be used for engine purposes provided they fulfil the Committee's requirements, which are as follow :—

1. For purposes for which **Cast Iron** is ordinarily employed, such as propeller bosses and blades, bed plates, engine framing and columns, brackets, weigh-shaft levers, pistons, cylinder covers, eccentric straps, bearing bushes, &c., the castings must be sound, and are to be subjected to such drop and hammering tests as are practicable.
2. For shafts or parts of shafts, and for purposes for which **forgings** are ordinarily employed, the material must also be subjected to the following tests :—
3. A tensile test is to be made from a piece taken from each casting. The tensile strength is not to exceed 30 tons per square inch, and the elongation is not to be less than 10 per cent. in a length of 8 inches, and a cold bending test, turned to $1\frac{1}{4}$ inches diameter or planed to $1\frac{1}{4}$ inches square, is to be capable of being bent without fracture through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.
4. All steel castings are to be thoroughly annealed.

COCKS, PIPES, AND SEA CONNECTIONS.

33. With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and vessels having *new engines or boilers* :—

34. All sea-cocks to be fitted on the plating of the vessel above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

35. The bolts securing all cocks or sea connections to the plating of the vessel are to be tapped into the plating of the vessel or fitted with countersunk heads.

36. The blow-off cocks on the plating of the vessel are to be fitted with spigots passing through

the plating, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

37. Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

38. The arrangements of pumps, bilge injections, suction and delivery pipes, to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

SPARE GEAR.

39. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

2 connecting rod or piston rod top-end bolts and nuts.
2 connecting rod bottom-end bolts and nuts.
2 main bearing bolts.
1 set of coupling bolts.
1 set of feed and bilge pump valves.
1 set of piston springs (where common springs are used).
A quantity of assorted bolts and nuts.
Iron of various sizes.

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft.
Propeller shaft.
Propeller, or a full set of blades.
Stern bush, or lignum vitæ lining for bush.
1 pair of connecting rod brasses.
1 pair of cross head brasses.
1 set of link brasses.
1 eccentric strap complete.
Air pump rod.
Circulating pump rod.
H. P. valve spindle.
L. P. valve spindle.
1 set of check valves.
6 cylinder cover bolts.
6 junk ring bolts.
4 valve chest cover bolts.
2 dozen boiler tubes.
3 dozen condenser tubes.
1 cylinder escape valve and spring.
1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS OF IRON BOILERS.

40. The strength of circular shells of iron boilers to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where C = co-efficient as per following table,
T = thickness of plate in inches,
D = mean diameter of shell in inches,
B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100.$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$B = \frac{n \times a}{p \times T} \times 90$ with iron rivets in iron plates with drilled holes.

(In case of rivets being in double shear, $1{\cdot}75a$ is to be used instead of a.)

where p = pitch of rivets,
d = diameter of rivets,
a = sectional area of rivets,
n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$-inch thick and under.	For Plates $\frac{3}{4}$-inch thick and above $\frac{1}{2}$-inch.	For Plates above $\frac{3}{4}$-inch thick.	
Lap Joint, Punched Holes	155	165	170	
Lap Joint, Drilled Holes	170	180	190	
Double Butt Strap Joint, Punched Holes	170	180	190	
Double Butt Strap Joint, Drilled Holes	180	190	200	

Note.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

CYLINDRICAL SHELLS OF STEEL BOILERS.

The strength of cylindrical shells of steel boilers is to be calculated from the following formula :—

$$\frac{C \times (T - 2) \times B}{D} = \text{working pressure in lbs. per square inch.}$$

where D = mean diameter of shell in inches.
T = thickness of plate in sixteenths of an inch.
C = 20 when the longitudinal seams are fitted with double butt straps of equal width.
C = 19·25 when they are fitted with double butt straps of unequal width, only covering on one side the reduced section of plate at the outer lines of rivets.
C = 18·5 when the longitudinal seams are lap joints.
B = the least percentage of strength of longitudinal joint found as follows :—

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times t} \times 85$ where steel rivets are used.

$$B = \frac{n \times a}{p \times t} \times 70 \text{ where iron rivets are used.}$$

where p = pitch of rivets in inches.

t = thickness of plate in inches.

d = diameter of rivet holes in inches.

n = number of rivets used per pitch in the longitudinal joint.

a = sectional area of rivet in square inches.

In case of rivets in double shear $1{\cdot}75a$ is to be used instead of a.

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the preceding tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted to be stayed from the top of the dome or otherwise stiffened.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the smallest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

Iron Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, and for all stays which are welded 6,000 lbs. per square inch ; for unwelded stays above $1\frac{1}{2}$ inches smallest diameter, 7,500 lbs. per square inch.

Steel Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 8,000 lbs. per square inch ; for stays above $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch. No steel stays are to be welded.

Stay Tubes.—The stress is not to exceed 7,500 lbs. per square inch.

FLAT PLATES.

The strength of flat plates supported by stays is to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

P = greatest pitch in inches,

C = 90 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with screw stays with riveted heads,

C = 100 for iron or steel plates above $\frac{7}{16}$ thick fitted with screw stays with riveted heads,

C = 110 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with stays and nuts,

C = 120 for iron plates above $\frac{7}{16}$ thick, and for steel plates above $\frac{7}{16}$ and under $\frac{9}{16}$ thick, fitted with screw stays and nuts,

C = 135 for steel plates $\frac{9}{16}$ thick and above, fitted with screw stays and nuts,

C = 140 for iron plates fitted with stays with double nuts,

$C = 150$ for iron plates fitted with stays with double nuts and washers outside the plates, of at least $\frac{1}{3}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

$C = 160$ for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, of at least $\frac{2}{5}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

$C = 175$ for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, when the washers are at least $\frac{2}{3}$ of the pitch in diameter and of the same thickness as the plates.

For iron plates fitted with stays with double nuts and doubling strips riveted to the outside of the plates, of the same thickness as the plates, and of a width equal to $\frac{2}{3}$ the distance between the rows of stays, C may be taken as 175, if P is taken to be the distance between the rows, and 190 when P is taken to be the pitch between the stays in the rows.

For steel plates, other than those for combustion chambers, the values of C may be increased as follows :—

$C = 140$ increased to 175,
150 „ 185,
160 „ 200,
175 „ 220,
190 „ 240.

If flat plates are strengthened with doubling plates securely riveted to them, having a thickness of not less than $\frac{2}{3}$ of that of the plates, the strength to be taken from

$$\frac{C \times (T + \frac{t}{2})^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where t = thickness of doubling plates in sixteenths, and C, T and P are as above.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

For steel tube plates in the nest of tubes the strength to be taken from

$$\frac{140 \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = the thickness of the plates in sixteenths of an inch,
P = the *mean* pitch of stay tubes from centre to centre.

For the wide water spaces between the nests of tubes the strength to be taken from

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where P = the horizontal distance from centre to centre of the bounding rows of tubes, and

$C = 120$ where the stay tubes are pitched with two plain tubes between them and are not fitted with nuts outside the plates,

$C = 130$ if they are fitted with nuts outside the plates,

$C = 140$ if each alternate tube is a stay tube not fitted with nuts,

$C = 150$ if they are fitted with nuts outside the plates,

$C = 160$ if every tube in these rows is a stay tube and not fitted with nuts,

$C = 170$ if every tube in these rows is a stay tube and each alternate stay tube is fitted with nuts outside the plates.

The thickness of tube plates of Combustion Chambers in cases where the pressure on the top of the chambers is borne by these plates is not to be less than that given by the following rule :—

$$T = \frac{P \times W \times D}{1600 \times (D - d)}$$

where P = working pressure in lbs. per square inch.
W = width of Combustion Chamber over plates in inches.
D = horizontal pitch of tubes in inches.
d = inside diameter of plain tubes in inches.
T = thickness of tube plates in sixteenths of an inch.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L - P) \times D \times L} = \text{working pressure in lbs. per square inch ;}$$

where L = width between tube plates, or tube plate and back plate of chamber,
P = pitch of stays in girders,
D = distance from centre to centre of girders,
d = depth of girder at centre,
T = thickness of girder at centre. All these dimensions to be taken in inches.

Wrought Iron.

$C =$ 6,000, if there is one stay to each girder.
9,000, if there are two or three stays to each girder.
10,000, if there are four or five stays to each girder.
10,500, if there are six or seven stays to each girder.
10,800, if there are eight stays or above to each girder.

Wrought Steel.

$C =$ 6,600, if there is one stay to each girder.
9,900, if there are two or three stays to each girder.
11,000, if there are four or five stays to each girder.
11,550, if there are six or seven stays to each girder.
11,880, if there are eight stays or above to each girder.

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89{,}600 \times T^2}{L \times D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plates in inches,
D = outside diameter of furnace in inches,
L = length of furnace in feet. If strengthening rings are fitted, the length between the rings is to be taken.

If the plates do not exceed $\frac{9}{16}$ inch in thickness, the pressure, however, is not to exceed

$$\frac{8{,}000 \times T}{D} = \text{lbs. per square inch.}$$

If the plates are of steel and exceed $\frac{9}{16}$ inch in thickness, the pressure is not to exceed

$$\frac{8{,}800 \times T}{D} = \text{lbs. per square inch.}$$

If the furnaces are fitted with a single Adamson ring at about the middle of their length, the pressure may be calculated from

$$\frac{10{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are fitted with two Adamson rings, then the pressure may be calculated from

$$\frac{11{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are fitted with a series of Adamson rings at intervals not exceeding 23 inches, the pressure may be calculated from

$$\frac{1{,}000 \times (T-2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plates in sixteenths of an inch,

D = outside diameter of furnaces in inches.

The strength of corrugated furnaces made of steel, having a less tensile strength than 26 tons per square inch, the corrugations being 6 inches apart and $1\frac{1}{2}$ inches deep, to be calculated from

$$\frac{1{,}000 \times (T-2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of furnaces made of steel, having a tensile strength between 26 and 30 tons per square inch, and corrugated on Fox's or Morison's plans, to be calculated from

$$\frac{1{,}259 \times (T-2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of ribbed furnaces (with ribs 9 inches apart), to be calculated from the following formula :—

$$\frac{1{,}160 \times (T-2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of spirally corrugated furnaces is to be calculated from the following formula :—

$$\frac{912 \times (T-2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

and D = outside diameter of corrugated furnaces or outside diameter of the plain part of ribbed furnaces in inches.

The strength of Holmes' patent furnaces, in which the corrugations are not more than 16 inches apart, from centre to centre, and not less than 2 inches high, to be calculated from the following formula :—

$$\text{Working pressure in lbs. per square inch} = \frac{945 \times (T-2)}{D}$$

where T = thickness of plain portions of furnace in sixteenths of an inch,

D = outside diameter of plain parts of the furnace in inches.

DONKEY BOILERS.

The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any cases where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULES FOR DETERMINING SIZES OF SHAFTS.

41. The diameters of crank and straight shafts are to be not less than those given by the following formula :—

For Compound Engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 04\,\mathbf{A} + \cdot 006\,\mathbf{D} + \cdot 02\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Triple expansion engines with three cranks at equal angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 038\,\mathbf{A} + \cdot 009\,\mathbf{B} + \cdot 002\,\mathbf{D} + \cdot 0165\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 034\,\mathbf{A} + \cdot 011\,\mathbf{B} + \cdot 004\,\mathbf{C} + \cdot 0014\,\mathbf{D} + \cdot 016\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with three cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot 028\,\mathbf{A} + \cdot 014\,\mathbf{B} + \cdot 006\,\mathbf{C} + \cdot 0017\,\mathbf{D} + \cdot 015\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with four cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot 033\,\mathbf{A} + \cdot 01\,\mathbf{B} + \cdot 004\,\mathbf{C} + \cdot 0013\,\mathbf{D} + \cdot 0155\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

where $\mathbf{A}$ = diameter of High Pressure Cylinder in inches,

$\mathbf{B}$ = diameter of first Intermediate Cylinder in inches,

$\mathbf{C}$ = diameter of second Intermediate Cylinder in inches,

$\mathbf{D}$ = diameter of Low Pressure Cylinder in inches,

S = Stroke of Pistons in inches,

P = Boiler pressure above atmosphere in lbs. per square inch.

The screw shaft to be the same diameter as is required for the crank shaft.

Immediate shafting should be at least $\frac{1}{2}\frac{9}{0}$ths of the diameter required for the crank shaft.

NOTE.—The Rules are intended to apply to Two Cylinder Compound Engines, in which the ratio of areas of Low and High Pressure Cylinders does not exceed 4·5 to 1 ; to Triple Expansion Engines in which it does not exceed 9 to 1 ; to Quadruple Expansion Engines in which it does not exceed 12 to 1 ; and in all cases, as regards the stroke, in which the length of stroke is not less than one half the diameter or greater than the diameter of the Low Pressure Cylinder. Engines of extreme proportions beyond these limits being specially submitted to be dealt with on their merits.

PERIODICAL SURVEYS. (*See* N.B. at foot.)

42. The machinery and boilers of all steam ships are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey upon the occasions of the vessels undergoing the Special periodical Surveys Nos. 1, 2, and 3, prescribed in the Rules, unless the machinery and boilers have been specially surveyed within a period of twelve months.

43. At these Special Surveys, and on other occasions if deemed necessary by the Surveyors, the propeller, stern-bush, and fastenings of the sea connections, are to be examined while the vessel is in dry dock, and, if deemed necessary by the Surveyors, the stern shaft is to be drawn and examined.

44. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

45. The sea connections and arrangements of cocks, pipes, bilge-suctions, roses, &c., are to be examined.

46. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure ; the safe working pressure is to be determined by their actual condition.

47. The safety valves are to be examined and set to the safe working pressure.

48. If satisfactory, these Surveys will be recorded in the Register Book thus :—"LMC9,91" *in red* or "B&MS9,91" *in red.*

49. "LMC" (LLOYD'S MACHINERY CERTIFICATE), with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

50. "B&MS" (BOILERS AND MACHINERY SURVEYED), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

51. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

52. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

53. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

54. The safety valves are to be examined and set to the safe working pressure.

55. If satisfactory, these surveys will be recorded in the Register Book thus: "BS9,91" *in red.*

56. "BS" (Boilers Surveyed), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

57. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

58. In Steam Vessels, the engines and boilers are to be considered as part of the equipment. (*See* Section 39, paragraphs 11 and 13.)

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE No. 438.*

BOILERS MADE OF STEEL.

NOTICE is hereby given, that the Committee of this Society have this day passed the following resolutions amending Notice No. 397 in regard to boilers made of steel:—

1. The use of steel will be sanctioned in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, provided the boilers be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled.

2. The material is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section,* with an ultimate elongation of not less than 20 per cent. in a length of eight inches. It is to be capable of being bent to a curve of which the inner radius is not greater than one and half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82° Fahrenheit.

Steel rivets are to be considered as part of the material, and in addition to be subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyor should represent the facts for the Committee's consideration.

produced is represented.* In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the furnaces and combustion chambers of the boilers.

4. The Society's Surveyor will attend at the steel works when necessary, and select the samples for testing before the plates are sheared to size, and these samples when marked by him for testing should, as far as practicable, be followed by the Surveyor through the different stages of preparation until the tests are completed.

5. The Society's Surveyor will require to have every facility placed in his way for tracing all plates to their respective charges and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the test applied to the material, is to be signed and forwarded to the boiler manufacturer, and the other to be retained by himself.

6. The samples are taken for testing in order that the general quality of the material may be ascertained, and if any sample should fail to fulfil the conditions laid down, the plate from which the sample is taken must be rejected; and further tests should be made before any material, made from the same cast or charge as the failing sample, can be approved.

7. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

8. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

9. No steel stays are to be welded.

10. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

By order of the Committee,

BERNARD WAYMOUTH,
Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.
19th May, 1881.

* When a great number of charges are represented in the number of plates submitted, a proportion of one tensile and one temper test to every ten plates will be deemed sufficient, providing they all prove to be satisfactory.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION, &c.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	£1	1	0
For each succeeding visit, when more than one visit is necessary	0	10	6

For special surveys special charges will be made, subject to the control of the Committee.

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an **A1*** or an **A1*** certificate; and once in every three years for vessels with an **A1, A1, A** or an **A** certificate. When Vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

First Survey.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally, and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water-line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

Second Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.

The windlass must be unhung when the main piece is of wood ; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

Third Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

Fourth Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast-trim water line.

Fifth Survey.

The vessel must be submitted to the same survey as before described for "Second Survey."

Sixth Survey or Special Survey.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions:—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee, she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time; and, before completing the report the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an A1* or A1* certificate, ten years for vessels with an A1 or A1 certificate, and nine years for vessels with an A or A certificate; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an A1* or A1* certificate, twenty years for vessels with an A1 or A1 certificate, and eighteen years for vessels with an A or A certificate.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
2, WHITE LION COURT, CORNHILL, E.C.
1st September, 1885.

EXTRACTS FROM THE RULES of the late UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING).

EQUIPMENT FOR STEAM VESSELS.

Section 29.—The equipment of Anchors and Chain Cables and Hawsers to be in accordance with TABLE 14 for Steam Vessels (*see below*).

The tonnage regulating equipment is to be the gross register tonnage under upper deck, with the addition of three-tenths of the tonnage of erections above upper deck.

TABLE No. 14.—ANCHORS, CHAINS, AND HAWSERS FOR STEAM VESSELS.

VESSELS TONNAGE. *See Section 29.*	Anchors, with either Iron or Wood Stocks.								Stud-chain Cables.			Stream Chain.		Hawsers and Warps.				VESSELS TONNAGE. *See Section 29.*
	Number.			Weight.					Minimum Size.	Proved to Admiralty Test.	Length.			Tow Rope.	Hawsers.	Warps.	Length	
				Bowers.		Stream	Kedge.	2d Kedge.										
	Bowers.	Stream.	Kedges.	Without Stock.	Admiralty Test.													
Tons. Tons.				Cwt.	Tons.	Cwt.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Fath.	Size.	Inches.	Inches.	Inches.	Fath.	Tons. Tons.
100 and under 150	2	1	...	3	4·9	1	...	...	$1\frac{1}{16}$	8·1	120	45	$\frac{8}{16}$	$5\frac{1}{2}$	$3\frac{1}{2}$	...	90	100 and under 150
150 „ 188	2	1	1	4	6·4	$1\frac{3}{4}$	1	...	$1\frac{3}{16}$	11·9	150	45	$\frac{9}{16}$	6	4	...	90	150 „ 188
188 „ 225	2	1	1	$5\frac{1}{4}$	7·6	2	1	...	$1\frac{4}{16}$	13·8	165	45	$\frac{10}{16}$	6	4	...	90	188 „ 225
225 „ 263	2	1	1	6	8·2	$2\frac{1}{2}$	$1\frac{1}{4}$	...	$1\frac{5}{16}$	15·8	165	45	$\frac{10}{16}$	$6\frac{1}{2}$	4	...	90	225 „ 263
263 „ 300	2	1	1	$7\frac{1}{4}$	9·5	$2\frac{3}{4}$	$1\frac{1}{4}$	...	1	18	165	45	$\frac{11}{16}$	7	5	...	90	263 „ 300
300 „ 375	3	1	1	$8\frac{1}{4}$	10·4	3	$1\frac{1}{2}$	...	$1\frac{1}{16}$	20·3	165	60	$\frac{11}{16}$	$7\frac{1}{2}$	$5\frac{1}{2}$	...	90	300 „ 375
375 „ 450	3	1	2	10	12·0	$4\frac{3}{4}$	$2\frac{1}{4}$	1	$1\frac{2}{16}$	22·8	195	60	$\frac{12}{16}$	8	6	...	90	375 „ 450
450 „ 525	3	1	2	12	13·9	5	$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{16}$	25·4	195	60	$\frac{12}{16}$	$8\frac{1}{2}$	$6\frac{1}{2}$	...	90	450 „ 525
525 „ 600	3	1	2	$13\frac{1}{2}$	15·2	6	3	$1\frac{1}{2}$	$1\frac{4}{16}$	28·1	210	60	$\frac{13}{16}$	9	7	...	90	525 „ 600
600 „ 675	3	1	2	$15\frac{1}{4}$	16·7	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{16}$	31	210	60	$\frac{13}{16}$	$9\frac{1}{2}$	7	4	90	600 „ 675
675 „ 750	3	1	2	$16\frac{3}{4}$	18·0	7	$3\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{6}{16}$	34	240	60	$\frac{14}{16}$	10	8	5	90	675 „ 750
750 „ 900	3	1	2	18	19·0	8	4	2	$1\frac{7}{16}$	37·2	240	60	$\frac{14}{16}$	10	8	5	90	750 „ 900
900 „ 1050	3	1	2	21	21·6	9	$4\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{8}{16}$	40·5	240	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	900 „ 1050
1050 „ 1200	3	1	2	$23\frac{1}{2}$	23·5	10	5	$2\frac{1}{2}$	$1\frac{9}{16}$	44	270	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	1050 „ 1200
1200 „ 1350	3	1	2	$25\frac{1}{2}$	25·2	$10\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{10}{16}$	47·5	270	75	1	10	$9\frac{1}{2}$	6	90	1200 „ 1350
1350 „ 1500	3	1	2	$27\frac{3}{4}$	26·9	11	$5\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{11}{16}$	51·2	270	75	1	10	10	6	90	1350 „ 1500
1500 „ 1800	3	1	2	30	28·6	12	6	3	$1\frac{12}{16}$	55·1	270	75	$1\frac{1}{16}$	11	$10\frac{1}{2}$	$6\frac{1}{2}$	90	1500 „ 1800
1800 „ 2100	3	1	2	32	30·1	13	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{13}{16}$	59·1	270	75	$1\frac{1}{16}$	11	11	7	90	1800 „ 2100
2100 „ 2400	3	1	2	34	31·6	$13\frac{1}{2}$	$6\frac{3}{4}$	$3\frac{1}{4}$	$1\frac{14}{16}$	63·3	270	75	$1\frac{2}{16}$	11	11	7	90	2100 „ 2400
2400 „ 2700	3	1	2	$36\frac{1}{2}$	33·4	14	7	$3\frac{1}{2}$	$1\frac{15}{16}$	67·6	270	90	$1\frac{2}{16}$	12	12	8	90	2400 „ 2700
2700 „ 3000	3	1	2	38	34·5	$14\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	2	72	270	90	$1\frac{3}{16}$	12	12	8	90	2700 „ 3000
3000 „ 3450	3	1	2	40	35·7	15	$7\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{16}$	76·6	270	90	$1\frac{3}{16}$	12	12	8	90	3000 „ 3450
3450 „ 3900	3	1	2	41	37·0	16	8	$4\frac{1}{4}$	$2\frac{2}{16}$	81·3	300	90	$1\frac{3}{16}$	12	12	8	90	3450 „ 3900
3900 „ 4500	4	1	2	43	38·0	$17\frac{1}{2}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{16}$	86·1	300	90	$1\frac{4}{16}$	12	12	9	90	3900 „ 4500
4500 „ 5250	4	1	2	45	39·2	19	$9\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{4}{16}$	91·1	330	90	$1\frac{4}{16}$	12	12	9	90	4500 „ 5250
5250 „ 6000	4	1	2	47	41	21	10	5	$2\frac{5}{16}$	96	330	90	$1\frac{5}{16}$	12	12	9	90	5250 „ 6000

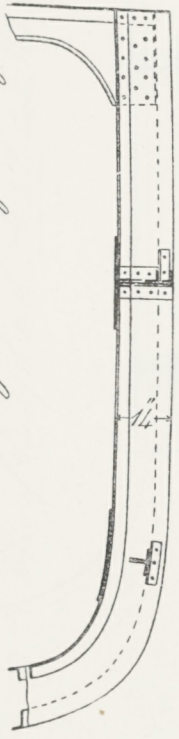
Anchors and Chains to be tested to Admiralty proof. A reduction of 15 per cent. will be allowed in the weight of the Third and Fourth Bower.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
2, WHITE LION COURT, CORNHILL, LONDON, E.C.—*15th April, 1893.*

Sketches illustrating the arrangement of Web-Frames and Side Stringers in lieu of Hold Beams, as per Section 14 a, paragraphs 9 to 19.

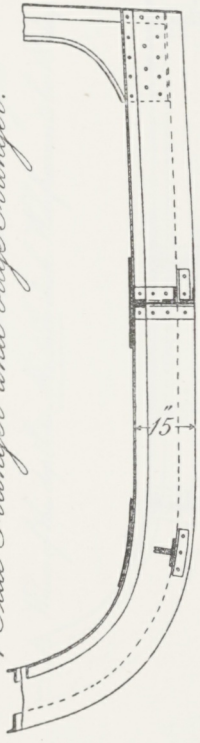
under 16 feet (par 9)

14" Web-frames, 8 frames spaces apart.
1 Side Stringer and bilge Stringer.



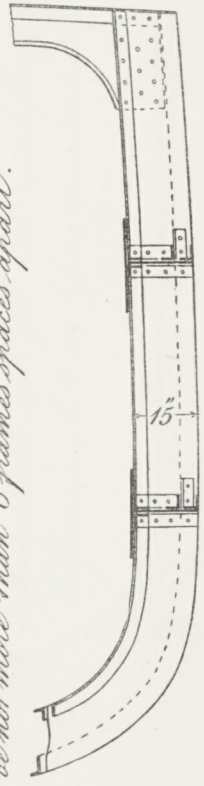
16 feet and under 17 feet (par 10)

15" Web-frames, 8 frames spaces apart.
1 Side Stringer and bilge Stringer.



17 feet and under 18 feet (par 11)

15" Web-frames, 8 frames spaces apart and 2 Side Stringers.
When under 18 feet to the Middle or Lower deck the Web-frames to be not more than 6 frames spaces apart.

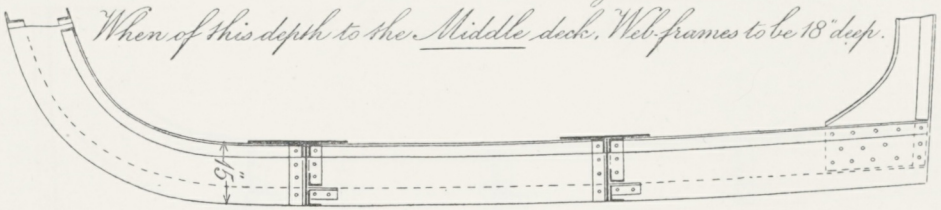


Web-frames and Side Stringers in lieu of Hold beams. (continued)

18 feet and under 21½ feet (Rule 12)

15" Web-frames, 6 frame spaces apart and 2 Side Stringers.

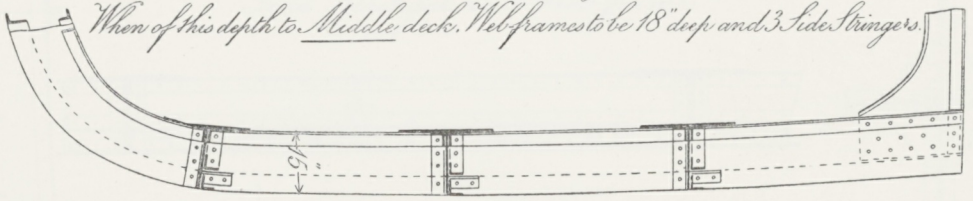
When of this depth to the Middle deck, Web-frames to be 18" deep.



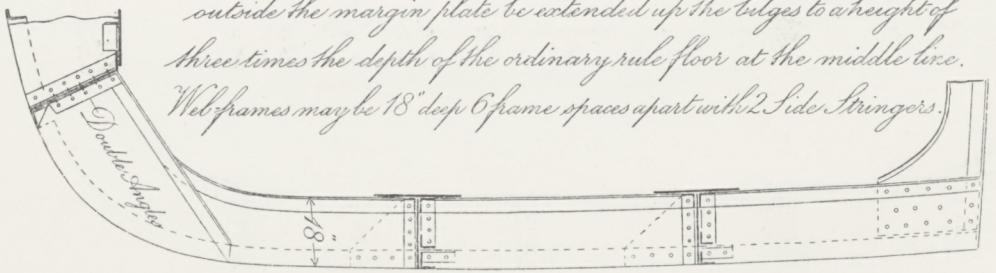
21½ feet and under 22½ feet (Rule 13)

15" Web-frames, 6 frame spaces apart and 3 Side Stringers.

When of this depth to Middle deck, Web-frames to be 18" deep and 3 Side Stringers.



Or, In Vessels fitted with double bottoms, provided the brackets outside the margin plate be extended up the bilges to a height of three times the depth of the ordinary rule floor at the middle line. Web-frames may be 18" deep 6 frame spaces apart with 2 Side Stringers.



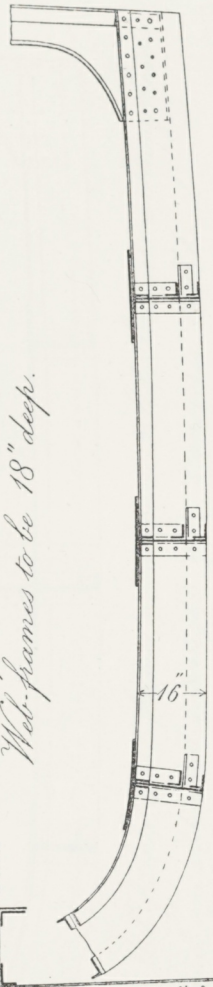
Web-frames and Side Stringers in lieu of Hold beams. (continued)

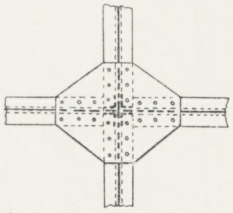
22½ feet and under 23½ feet (par 14)

Diamond Plates.

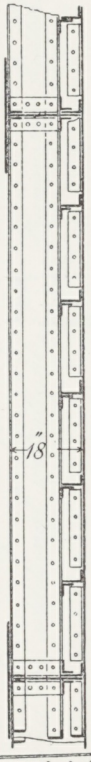
23½ feet and under 24. feet (par 15)

16" Web-frames, 6 frame spaces apart and 3 Side Stringers.
When of this depth to the Middle deck
Web-frames to be 18" deep.

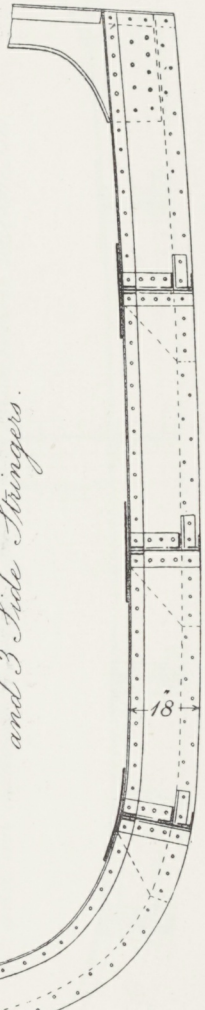


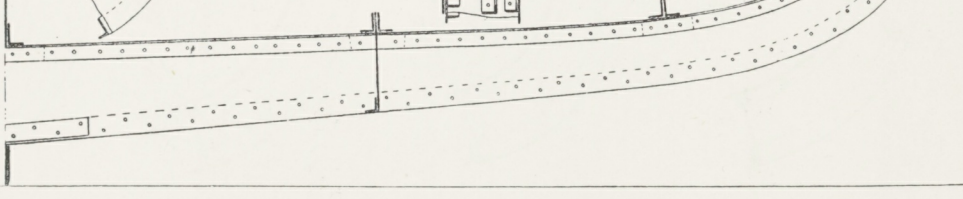


Side Stringer and Web-frame



18" Web-frames, 6 frame spaces apart and 3 Side Stringers.

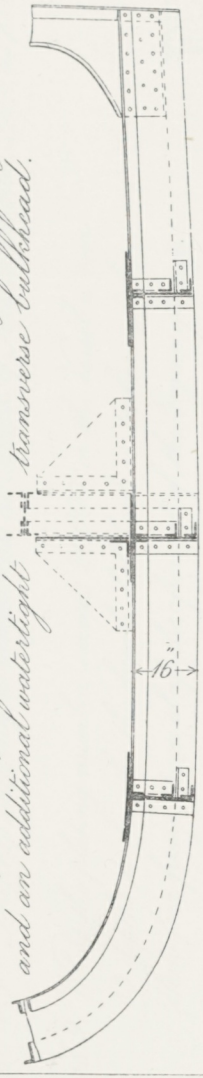




Web frames in way of Raised Quarter Deck in lieu of lower deck beams and beams of extra strength wide spaced in lower hold. (see section 14a paragraphs 16 to 19)

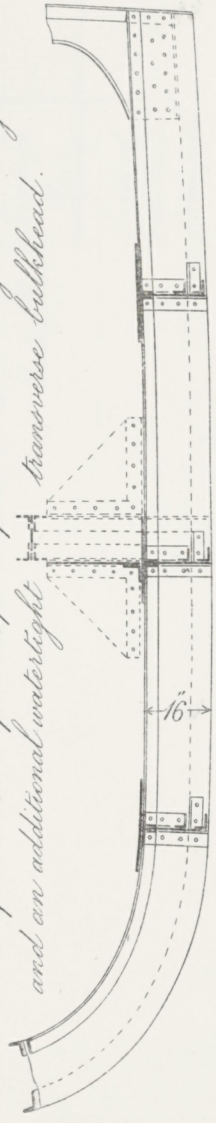
24 feet and under 25 feet (par 16)

16" Web frames, 5 frame spaces apart; 3 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.



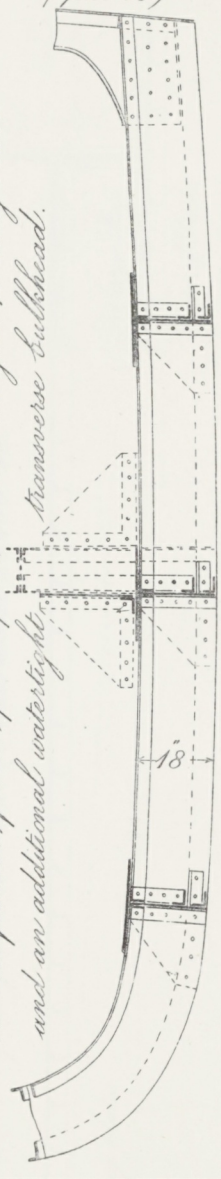
25 feet and under 26 feet (par 17)

16" Web frames, 4 to 5 frame spaces apart; 3 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.



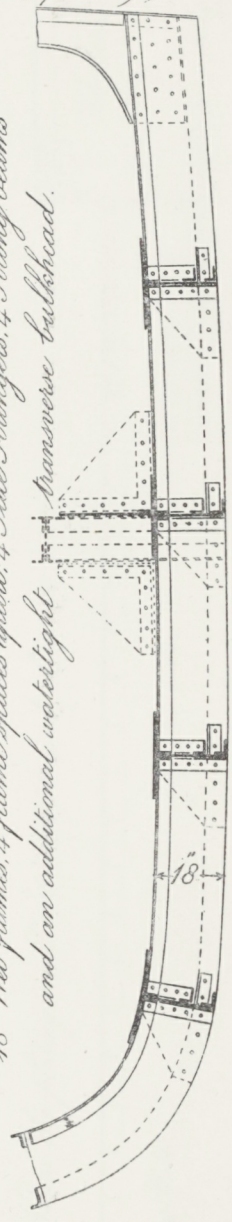
26 feet and under 27 feet (par 18)

18" Web frames, 4 frame spaces apart; 3 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.



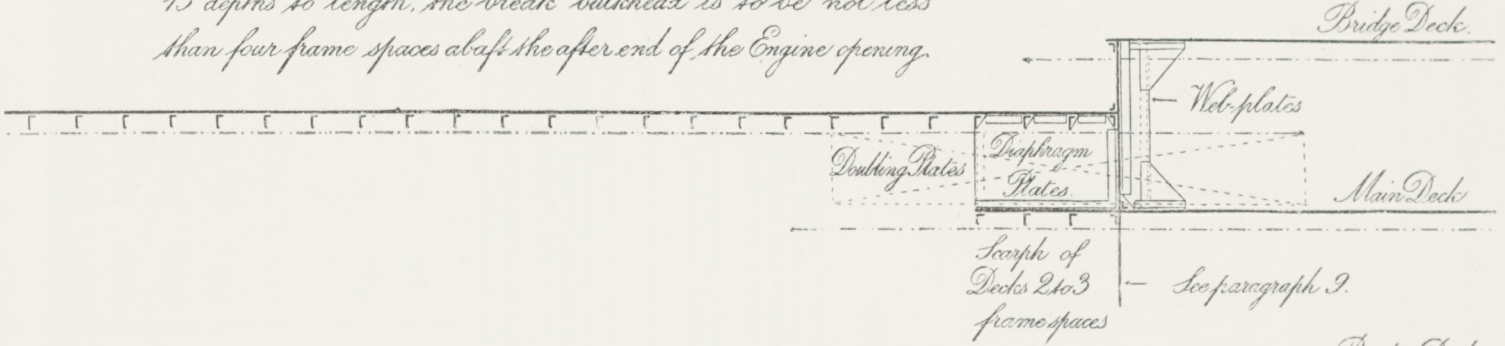
27 ft. and under 28 ft. (par 19)

18" Web frames, 4 frame spaces apart; 4 Side Stringers, 4 Strong beams and an additional watertight transverse bulkhead.

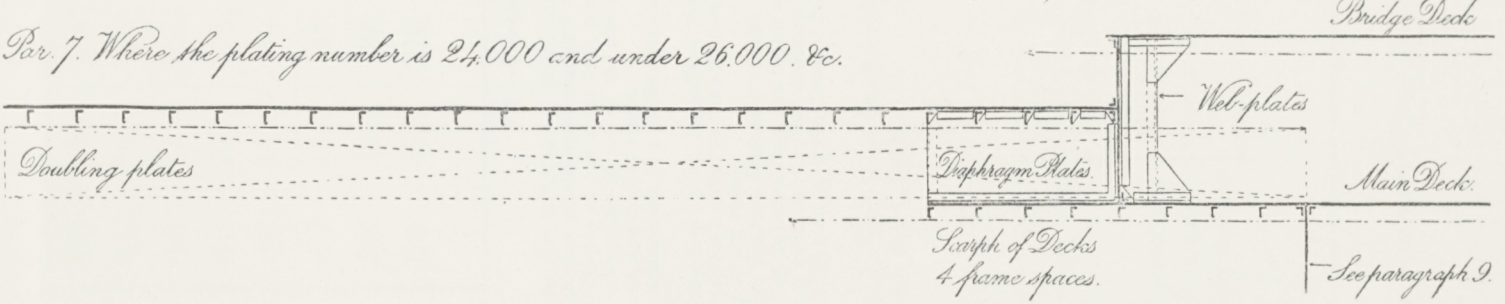


Section 15. Sketches shewing arrangements at Break of Raised Quarter Deck as per paragraphs 5.6.7.8 & 9.

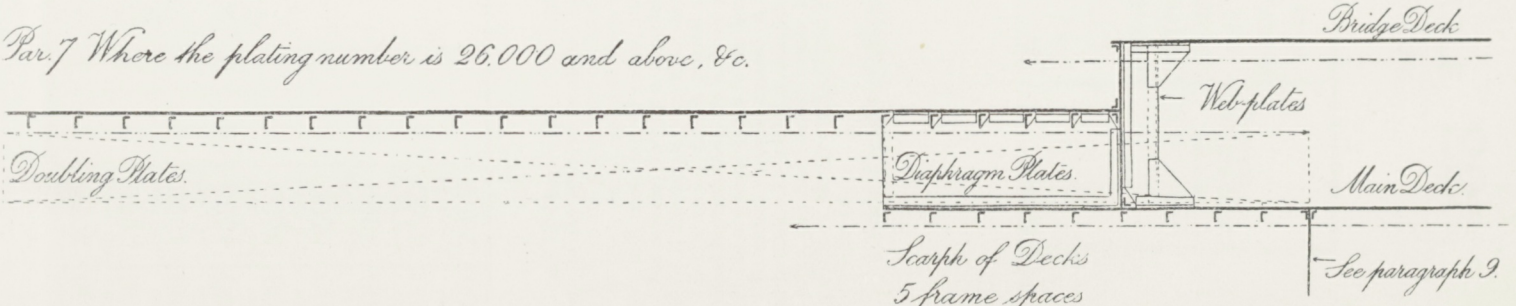
Paragraph 9. Where the plating number exceeds 20,000 or the Vessel is over 13 depths to length, the break bulkhead is to be not less than four frame spaces abaft the after end of the Engine opening.



Par. 7. Where the plating number is 24,000 and under 26,000. &c.



Par. 7 Where the plating number is 26,000 and above, &c.



Extract from the Rules, Section 32.

Tonnage for Regulating the Scantlings and Equipment (as regards Anchors, Chains, &c.) of Wood and Composite Vessels.

In flush-decked vessels having either one, two or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

† In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, or awning-deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment.

No. 304.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHAIN CABLES.

Testing to Breaking Strain.

"Chains tested under the Chain Cable and Anchor Act of 1864, at a Machine recognised by the Committee, will be accepted for any Vessel built, commenced, or contracted for *prior* to the 1st July, 1872; and all Vessels built, commenced, or contracted for *after* the 30th June, 1872, will be required to be supplied with Chains tested in conformity with the requirements of the New Act."

By order of the Committee,
BERNARD WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
1st January, 1873.

(i) STEEL WIRE TOWLINES, HAWSERS AND WARPS.

(i) When steel wire towlines, hawsers, or warps are adopted, a short length of each of the wires composing the towline, &c., will be required, after being galvanised, to withstand a tensile stress equivalent to that set forth in Table 22, and the aggregate strength of the wires must not be less than ten per cent. in excess of that stress.

Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

Each manufacturer to be required to provide on his premises machines suitable for satisfactorily making the foregoing tests, and the works to be at all times open to the inspection of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which a certificate has been issued by the manufacturer.

Printed Forms of Certificates, approved by the Committee, to be given by the Manufacturers of Steel Wire Hawsers, will be supplied to them upon application to the Secretary.

20th December, 1883.

CHAINS AND ANCHORS FOR SAILING VESSELS.

(*For Steam Vessels, see other side*).

TABLE 22.

Minimum Weights of Anchors, ex. Stock; Sizes, Lengths and Weights of Chains, and the Proof Strain to which they are to be tested per Chain Cables and Anchors Acts. Also Sizes and Lengths of Towlines, Hawsers and Warps. The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

N.B.—The Italic letters preceding the Equipment numbers correspond with letters printed in the eighth column in the List of Sailing Vessels in the Register Book to indicate the Equipment numbers of Vessels per this Table.

Numbers for IRON AND STEEL Vessels. See Footnote (a).	GROSS TONNAGE LESS CREW SPACE. See Note†	ANCHORS. NUMBER. Bowers.	Stream.	Kedge.	BOWER ANCHORS (b) (d). Ex. Stock. Weight	Test.*	Collective Weight.	STREAM AND KEDGE ANCHORS. Ex. Stock. Stream.	Test.*	Kedge.	Test.*
	Tons.				Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Tons.
a 1900 and under	50 and under	2	1	1	3½	5 18/20	7	¾	—	½	—
b 2500 and under	75 and under	2	1	1	4¼	6 12/20	8½	1¼	—	½	—
c 3100 and under	100 and under	2	1	1	5	7 7/20	10	1½	3 18/20	¾	—
d 3650 and under	125 and under	2	1	1	5¾	8	11½	1½	3 18/20	¾	—
e 4200 and under	150 and under	2	1	1	6½	8 15/20	13	2	4 10/20	1	—
f 4700 and under	175 and under	2	1	1	7¼	9 9/20	14½	2¼	4 15/20	1	—
g 5150 and under	200 and under	3	1	1	8¼	10 7/20	23½	2½	5	1¼	—
h 6000 and under	250 and under	3	1	1	10	12	28½	3¾	6 3/20	1¾	4 4/20
i 6800 and under	300 and under	3	1	1	12	13 17/20	34¼	4	6 7/20	2	4 10/20
j 7550 and under	350 and under	3	1	1	13½	15 3/20	38½	4¾	7 2/20	2½	5
k 8250 and under	400 and under	3	1	1	15¼	16 14/20	43½	5¼	7 11/20	2½	5
l 8900 and under	450 and under	3	1	1	16¾	18	47¾	5½	7 16/20	2¾	5 5/20
m 9600 and under	500 and under	3	1	1	18	19	51¼	6½	8 5/20	3¼	5 14/20
n 10800 and under	600 and under	3	1	1	21	21 12/20	60	7¼	9 9/20	3½	5 18/20
o 12000 and under	700 and under	3	1	1	23½	23 10/20	67	8	10 2/20	4	6 7/20
p 13200 and under	800 and under	3	1	1	25½	25 3/20	72¾	8½	10 12/20	4¼	6 12/20
q 14400 and under	900 and under	3	1	1	27¾	26 18/20	79	8¾	10 17/20	4½	6 17/20
r 15500 and under	1000 and under	3	1	1	30	28 12/20	85½	9½	11 11/20	4¾	7 2/20
s 17600 and under	1200 and under	3	1	1	32	30 2/20	91¼	10½	12 8/20	5¼	7 11/20
t 19600 and under	1400 and under	3	1	1	34	31 12/20	97	10¾	12 13/20	5½	7 16/20
u 21600 and under	1600 and under	3	1	1	36½	33 8/20	104	11¼	13 2/20	5½	7 18/20
v 23400 and under	1800 and under	3	1	1	38	34 10/20	108¼	11½	13 7/20	5¾	8
w 25100 and under	2000 and under	3	1	1	40	35 18/20	114	12	13 17/20	6	8 5/20
x 29400 and under	2500 and under	3	1	1	42	37 3/20	119¾	13½	15 3/20	6¾	9
y 33400 and under	3000 and under	3	1	1	45	39 5/20	128¼	15¼	16 14/20	7½	9 13/20
z 37200 and under 40800	3500 and under 4000	4	1	1	48	41 3/20	185	17	18 5/20	8½	10 13/20

Numbers for IRON AND STEEL Vessels. See Footnote (a).	GROSS TONNAGE LESS CREW SPACE. See Note†	CHAIN CABLES, HAWSERS, &c. STUD-CHAIN CABLES (e) (f) (h). Length.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight.			STREAM, CHAIN OR STEEL WIRE (e) (g). Length.	CHAIN. Size.	Minimum Weight. Stud Link.			Short Link.			STEEL WIRE (i) Size.	Breaking Test.	TOWLINE: HEMP OR STEEL WIRE (i) Length.	HEMP. Size.	STEEL WIRE. Size.	Breaking Test.	HAWSERS AND WARPS. 90 fathoms of each.		GROSS TONNAGE LESS CREW SPACE. See Note†	Numbers for IRON AND STEEL Vessels. See Footnote (a)
	Tons.	Fathoms.	Inches.	Tons.	Tons.	Cwts.	qrs.	lbs.	Fathoms.	Inches.	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Inches.	Tons.	Fathoms.	Inches.	Inches.	Tons.	Inches.	Inches.	Tons.	
a 1900 and under	50 and under	120	1 1/16	8 5/10	12¾	29	0	14	45	7/16	5	1	0	5	3	0	—	—	75	5	—	—	3	—	50 and under	*a* 1900 and under
b 2500 and under	75 and under	120	1 2/16	10⅛	15⅛	34	2	7	45	8/16	6	2	0	7	1	0	—	—	75	5½	—	—	3	—	75 and under	*b* 2500 and under
c 3100 and under	100 and under	135	1 3/16	11⅞	17 8/10	45	3	3	45	8/16	6	2	0	7	1	0	—	—	75	5½	—	—	3	—	100 and under	*c* 3100 and under
d 3650 and under	125 and under	165	1 4/16	13¾	20⅝	64	1	11	45	8/16	6	2	0	7	1	0	—	—	75	6	—	—	3½	—	125 and under	*d* 3650 and under
e 4200 and under	150 and under	165	1 5/16	15 8/10	23 7/10	74	1	26	45	9/16	8	0	0	8	3	0	2	7	75	6½	—	—	4	—	150 and under	*e* 4200 and under
f 4700 and under	175 and under	165	1	18	27	84	0	17	45	9/16	8	0	0	8	3	0	2	7	75	6½	—	—	4	—	175 and under	*f* 4700 and under
g 5150 and under	200 and under	165	1 1/16	20 3/10	30 4/10	95	1	9	45	10/16	9	3	0	10	2	0	2¼	9½	75	7	—	—	4	—	200 and under	*g* 5150 and under
h 6000 and under	250 and under	195	1 2/16	22¾	34⅛	126	1	0	45	10/16	9	3	0	10	2	0	2¼	9½	75	7½	—	—	5	—	250 and under	*h* 6000 and under
i 6800 and under	300 and under	195	1 3/16	25⅝	38	141	0	16	60	11/16	14	2	7	15	3	7	2¾	15½	75	8	—	—	5½	—	300 and under	*i* 6800 and under
j 7550 and under	350 and under	210	1 4/16	28⅛	42⅛	168	0	0	60	11/16	14	2	7	15	3	7	2¾	15½	75	8	—	—	5½	—	350 and under	*j* 7550 and under
k 8250 and under	400 and under	210	1 5/16	31	46½	185	2	12	60	12/16	17	1	3	18	3	3	2¾	15½	75	8½	—	—	6	—	400 and under	*k* 8250 and under
l 8900 and under	450 and under	240	1 6/16	34	51	232	0	21	60	12/16	17	1	3	18	3	3	2¾	15½	75	9	—	—	6½	—	450 and under	*l* 8900 and under
m 9600 and under	500 and under	240	1 7/16	37⅛	55⅝	254	0	19	60	13/16	20	1	11	22	0	11	3	18	75	9½	—	—	7	—	500 and under	*m* 9600 and under
n 10800 and under	600 and under	240	1 8/16	40 5/10	58 7/10	276	2	14	60	13/16	20	1	11	22	0	11	3	18	90	10	3¼	22	7	4	600 and under	*n* 10800 and under
o 12000 and under	700 and under	270	1 9/16	43 9/10	61 4/10	336	0	0	60	14/16	23	1	17	25	1	17	3¼	22	90	10	3¼	22	8	5	700 and under	*o* 12000 and under
p 13200 and under	800 and under	270	1 10/16	47 1/10	66 5/10	359	1	9	75	14/16	29	1	0	31	2	0	3¼	22	90	10	3¼	22	8	5	800 and under	*p* 13200 and under
q 14400 and under	900 and under	270	1 11/16	51¼	71¾	387	3	4	75	15/16	33	3	11	36	1	11	3½	26	90	10½	3¼	22	9	5½	900 and under	*q* 14400 and under
r 15500 and under	1000 and under	270	1 12/16	55⅛	77⅛	416	3	0	75	15/16	33	3	11	36	1	11	3½	26	90	10½	3¼	22	9	5½	1000 and under	*r* 15500 and under
s 17600 and under	1200 and under	270	1 13/16	59⅛	82¾	447	2	3	75	1	38	1	0	41	1	0	3¾	29	90	11	3½	26	9½	6	1200 and under	*s* 17600 and under
t 19600 and under	1400 and under	270	1 14/16	63¼	88 5/10	478	1	18	75	1	38	1	0	41	1	0	3¾	29	90	11	3½	26	10	6	1400 and under	*t* 19600 and under
u 21600 and under	1600 and under	270	1 15/16	67 5/10	94 5/10	511	1	14	75	1 1/16	43	1	9	46	1	9	4	33	90	11	3½	26	10½	6½	1600 and under	*u* 21600 and under
v 23400 and under	1800 and under	270	2	72	100 8/10	538	3	0	75	1 1/16	43	1	9	46	1	9	4	33	90	12	4	33	11	7	1800 and under	*v* 23400 and under
w 25100 and under	2000 and under	270	2 1/16	76 5/10	107 1/10	573	2	14	100	1 2/16	64	2	27	68	0	27	4¼	35	90	12	4	33	11	7	2000 and under	*w* 25100 and under
x 29400 and under	2500 and under	300	2 3/16	86⅛	120 5/10	717	2	0	120	1 2/16	77	2	21	83	1	21	4¼	35	90	13	4½	39	12	8	2500 and under	*x* 29400 and under
y 33400 and under	3000 and under	300	2 5/16	96¼	134¾	800	3	14	120	1 3/16	86	3	12	93	0	12	4½	39	90	13	4½	39	12	8	3000 and under	*y* 33400 and under
z 37200 and under 40800	3500 and under 4000	300	2 6/16	101½	142	844	1	0	120	1 4/16	96	0	0	103	0	0	4¾	43	120	14	4¾	43	13	9	3500 and under 4000	*z* 37200 and under 40800

(a) By Section 39 of the Rules for the Building and Classification of *Iron and Steel Vessels*, it is provided that "The equipment is to be regulated by the *Number* produced by the sum of the measurements of the half-moulded breadth of the vessel at the middle of the length, the depth from the upper part of keel to the top of the upper-deck beams, with the normal round-up, and the girth of the half-midship frame section of the vessel, measured from the centre line at top of keel to the upper deck stringer plate, multiplied by the length of the vessel, for a one, two, and three-decked vessel, and for a spar-decked vessel."

For a vessel with a poop, top-gallant forecastle, or a raised quarter-deck, the equipment number to be increased *one-fifteenth* beyond that which it would be if she were flush-decked.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill.
13th April, 1893.

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the above Table may be modified as under:—
Where two Bower Anchors only are required, one of them may be 7½ per cent. lighter than the weight set forth above, provided the collective weight of the two Anchors is equal to that given in the Table.
Where three Bower Anchors are required, one of them may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the three Anchors is equal to that given in the Table, but in no case may the best Bower Anchor be lighter than prescribed in the Table, nor the third Bower be lighter than is allowed by this footnote.
All Anchor Stocks must be of acknowledged and approved description, and be one-fourth the weight of the anchor given in the Table.

(d) All Anchors, including Stream and Kedge Anchors, exceeding 168 lbs. in weight, ex. Stock, to be tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

* The tests of Anchors in this Table are approximate tests; or as near the Statutory tests as can be expressed in tons and aliquot parts.

(e) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(f) There should be included in the above weights, 2 End Shackles to each Cable; that is 4 for each outfit which contains two Cables.

(g) There should be included in the above weights, 2 End Shackles to each Stream Chain.

(h) Unstudded close-link Chains will be admitted as Cables, if proved to *two-thirds* the Test required for Stud-link Chains, for the *tensile* strain, and 100 per cent. above the *tensile* strain for the *breaking* strain.

(i) When steel wire Towlines or Hawsers are adopted, see note i at side of Table.

Where a departure from the requirements of the Table for Hawsers and Warps is proposed, the same should be in all cases submitted in the first place for the approval of the Committee.

(*For Sailing Vessels see other side.*)

TABLE 22.

CHAINS AND ANCHORS FOR STEAM VESSELS.

Minimum Weights of Anchors, ex. Stock and Stockless; Sizes, Lengths and Weights of Chains, and the Proof Strain to which they are to be tested per Chain Cables and Anchors Act. Also Sizes and Lengths of Towlines, Hawsers and Warps. The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

ANCHORS.

Numbers for IRON AND STEEL Vessels. See Footnote (a)	GROSS TONNAGE LESS CREW SPACE. See Note†	BOWER ANCHORS (b) (d) NUMBER. Bowers.	Stream.	Kedge.	Ex. Stock. Weight.	Test. *	Collective Weights.	Stockless. Weight.	Test. *	Collective Weight.	STREAM AND KEDGE ANCHORS (c) Ex Stock. Stream.	Test. *	Kedge.	Test. *
	Tons.				Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Tons.
a 2750 and under *b* 3750	75 and under 112	2	1	1	3½	5 1⁸⁄₂₀	7	4½	6 1⁷⁄₂₀	8¾	¾	—	½	—
b 3750 and under *c* 4630	112 and under 150	2	1	1	4¼	6 1⁄₂₀	8½	5¼	7 1⁄₂₀	10½	1¼	—	½	—
c 4630 and under *d* 5420	150 and under 188	2	1	1	5	7 7⁄₂₀	10	6¼	8 1⁰⁄₂₀	12½	1½	3 1⁸⁄₂₀	¾	—
d 5420 and under *e* 6150	188 and under 225	2	1	1	5¾	8	11½	7¼	9 9⁄₂₀	14¼	1½	3 1⁸⁄₂₀	¾	—
e 6150 and under *f* 6840	225 and under 262	2	1	1	6½	8 1⁵⁄₂₀	13	8¼	10 7⁄₂₀	16¼	2	4 1⁰⁄₂₀	1	—
f 6840 and under *g* 7490	262 and under 300	2	1	1	7¼	9 3⁄₂₀	14½	9	11 2⁄₂₀	18	2¼	4 1⁵⁄₂₀	1	—
g 7490 and under *h* 8670	300 and under 375	3	1	1	8¼	10 7⁄₂₀	23½	10¼	12 4⁄₂₀	29¼	2½	5	1¼	—
h 8670 and under *i* 9770	375 and under 450	3	1	1	10	12	28½	12½	14 6⁄₂₀	35½	3¾	6 3⁄₂₀	1¾	4 4⁄₂₀
i 9770 and under *j* 10790	450 and under 525	3	1	1	12	13 1⁷⁄₂₀	34¼	15	16 1⁰⁄₂₀	42¾	4	6 7⁄₂₀	2	4 1⁰⁄₂₀
j 10790 and under *k* 11740	525 and under 600	3	1	1	13½	15 3⁄₂₀	38½	16¾	18	48	4¾	7 2⁄₂₀	2½	5
k 11740 and under *l* 12620	600 and under 675	3	1	1	15¼	16 1⁄₂₀	43½	19	19 1⁷⁄₂₀	54¼	5¼	7 1⁄₂₀	2½	5
l 12620 and under *m* 13450	675 and under 750	3	1	1	16¾	18	47¾	20¾	21 8⁄₂₀	59½	5½	7 1⁶⁄₂₀	2¾	5 5⁄₂₀
m 13450 and under *n* 15120	750 and under 900	3	1	1	18	19	51¼	22½	22 1⁵⁄₂₀	64	6½	8 1⁄₂₀	3¼	5 1⁄₂₀
n 15120 and under *o* 16720	900 and under 1050	3	1	1	21	21 1⁄₂₀	60	26¼	25 1⁶⁄₂₀	75	7¼	9 2⁄₂₀	3½	5 1⁸⁄₂₀
o 16720 and under *p* 18260	1050 and under 1200	3	1	1	23½	23 1⁰⁄₂₀	67	29¼	28 1⁄₂₀	83¾	8	10 2⁄₂₀	4	6 7⁄₂₀
p 18260 and under *q* 19780	1200 and under 1350	3	1	1	25½	25 3⁄₂₀	72¾	31¾	29 1⁸⁄₂₀	90¾	8½	10 1⁄₂₀	4¼	6 1⁄₂₀
q 19780 and under *r* 21280	1350 and under 1500	3	1	1	27¾	26 1⁄₂₀	79	34½	32	98¾	8¾	10 1⁷⁄₂₀	4½	6 1⁷⁄₂₀
r 21280 and under *s* 24220	1500 and under 1800	3	1	1	30	28 1⁄₂₀	85½	37½	34 2⁄₂₀	106¾	9½	11 1⁄₂₀	4¾	7 3⁄₂₀
s 24220 and under *t* 27140	1800 and under 2100	3	1	1	32	30 2⁄₂₀	91¼	40	35 1⁄₂₀	114	10½	12 3⁄₂₀	5¼	7 1⁄₂₀
t 27140 and under *u* 30020	2100 and under 2400	3	1	1	34	31 1⁄₂₀	97	42½	37 1⁄₂₀	121¼	10¾	12 1⁄₂₀	5½	7 1⁶⁄₂₀
u 30020 and under *v* 32820	2400 and under 2700	3	1	1	36½	33 3⁄₂₀	104	45½	39 1⁄₂₀	130	11¼	13 2⁄₂₀	5½	7 1⁶⁄₂₀
v 32820 and under *w* 35450	2700 and under 3000	3	1	1	38	34 1⁄₂₀	108¼	47½	40 1⁶⁄₂₀	135¼	11½	13 7⁄₂₀	5¾	8
w 35450 and under *x* 39600	3000 and under 3500	3	1	1	40	35 1⁄₂₀	114	50	42 7⁄₂₀	142½	12	13 1⁷⁄₂₀	6	8 5⁄₂₀
x 39600 and under *y* 43600	3500 and under 4000	4	1	1	41½	36 1⁶⁄₂₀	159¾	51¾	43 9⁄₂₀	199½	12¾	14 1⁄₂₀	6½	8 1⁵⁄₂₀
y 43600 and under *z* 47400	4000 and under 4500	4	1	1	43	37 1⁄₂₀	165½	53¾	44 1⁄₂₀	206¾	14	15 1⁄₂₀	7	9 5⁄₂₀
z 47400 and under *a*† 51000	4500 and under 5000	4	1	1	45	39 2⁄₂₀	173¼	56¼	46 3⁄₂₀	216½	15¼	16 1⁄₂₀	7½	9 1⁵⁄₂₀
a† 51000 and under *b*† 55000	5000 and under 5500	4	1	1	46½	40 3⁄₂₀	179	58	47 5⁄₂₀	223¾	16¾	18	8½	10 1⁄₂₀
b† 55000 and under *c*† 59000	5500 and under 6000	4	1	1	49	41 1⁄₂₀	188	61¼	49	235	19	19 1⁷⁄₂₀	9½	11 1⁄₂₀
c† 59000 and under *d*† 63000	6000 and under 6500	4	1	1	52	43 1⁄₂₀	198	65	51	247½	22	22 7⁄₂₀	10½	12 5⁄₂₀
d† 63000 and under 70000	6500 and under 7000	4	1	1	55	45 7⁄₂₀	210	68¾	53 1⁄₂₀	262½	25	24 1⁷⁄₂₀	12	13 1⁷⁄₂₀

CHAIN CABLES, HAWSERS, &c.

Numbers for IRON AND STEEL Vessels. See Footnote (a)	GROSS TONNAGE LESS CREW SPACE. See Note†	STUD-CHAIN CABLES (e) (f) (h) Length.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight.	STREAM, CHAIN or STEEL WIRE (e) (g) Length.	CHAIN. Size.	Minimum Weight. Stud Link.	Short Link.	STEEL WIRE (i) Size.	Breaking Test.	TOWLINE: HEMP OR STEEL WIRE (i) Length.	HEMP. Size.	STEEL WIRE. Size.	Breaking Test.	HAWSERS AND WARPS. 90 Fathoms of each.	
	Tons.	Fathoms.	Inches.	Tons.	Tons.	Cwts. qrs. lbs.	Fathoms.	Inches.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Inches.	Tons.	Fathoms.	Inches.	Inches.	Tons.	Inches.	Inches.
a 2750 and under *b* 3750	75 and under 112	120	1 1⁄₁₆	8 5⁄₁₀	12¾	29 0 14	45	⅝	6 2 0	7 1 0	—	—	75	5½	—	—	3	—
b 3750 and under *c* 4630	112 and under 150	120	1 2⁄₁₆	10⅛	15⅛	34 2 7	45	9⁄₁₆	8 0 0	8 3 0	2	7	75	6	—	—	4	—
c 4630 and under *d* 5420	150 and under 188	135	1 3⁄₁₆	11⅞	17 8⁄₁₀	45 3 3	45	9⁄₁₆	8 0 0	8 3 0	2	7	75	6	—	—	4	—
d 5420 and under *e* 6150	188 and under 225	165	1 4⁄₁₆	13¾	20⅝	64 1 11	45	10⁄₁₆	9 3 0	10 2 0	2¼	9½	75	6½	—	—	4	—
e 6150 and under *f* 6840	225 and under 262	165	1 5⁄₁₆	15 8⁄₁₀	23 7⁄₁₀	74 1 26	45	10⁄₁₆	9 3 0	10 2 0	2¼	9½	75	7	—	—	5	—
f 6840 and under *g* 7490	262 and under 300	165	1	18	27	84 0 17	45	11⁄₁₆	10 3 19	11 3 19	2¾	15½	75	7½	—	—	5½	—
g 7490 and under *h* 8670	300 and under 375	165	1 1⁄₁₆	20 3⁄₁₀	30 4⁄₁₀	95 1 9	60	1⅛	14 2 7	15 3 7	2¾	15½	75	7½	—	—	5½	—
h 8670 and under *i* 9770	375 and under 450	195	1 2⁄₁₆	22¾	34⅛	126 1 0	60	1⅛	17 1 3	18 3 3	2¾	15½	75	8	—	—	6	—
i 9770 and under *j* 10790	450 and under 525	195	1 3⁄₁₆	25⅜	38	141 0 16	60	1⅛	20 1 11	22 0 11	3	18	75	8½	—	—	6½	—
j 10790 and under *k* 11740	525 and under 600	210	1 4⁄₁₆	28⅛	42⅛	168 0 0	60	1⅛	20 1 11	22 0 11	3	18	75	8½	—	—	6½	4
k 11740 and under *l* 12620	600 and under 675	210	1 5⁄₁₆	31	46½	185 2 12	60	1⅛	23 1 17	25 1 17	3¼	22	90	9	—	—	7	5
l 12620 and under *m* 13450	675 and under 750	210	1 6⁄₁₆	34	51	203 0 18	60	1⅛	23 1 17	25 1 17	3¼	22	90	9	—	—	7	5
m 13450 and under *n* 15120	750 and under 900	210	1 7⁄₁₆	37⅜	55⅜	222 1 17	60	1⅛	27 0 9	29 0 9	3½	26	90	9½	—	—	7½	5½
n 15120 and under *o* 16720	900 and under 1050	210	1 8⁄₁₆	40 5⁄₁₀	58 7⁄₁₀	242 0 5	75	1⅛	33 3 11	36 1 11	3½	26	90	10	3¼	22	8	5½
o 16720 and under *p* 18260	1050 and under 1200	240	1 9⁄₁₆	43 1⁄₁₀	61 4⁄₁₀	298 2 19	75	1	38 1 0	41 1 0	3¾	29	90	10	3¼	22	8	6
p 18260 and under *q* 19780	1200 and under 1350	240	1 10⁄₁₆	47 5⁄₁₀	66 5⁄₁₀	319 1 17	75	1	38 1 0	41 1 0	3¾	29	90	10	3¼	22	8½	6
q 19780 and under *r* 21280	1350 and under 1500	240	1 11⁄₁₆	51¼	71¾	344 2 22	75	1 1⁄₁₆	43 1 9	46 1 9	4	33	90	11	3½	26	9	7
r 21280 and under *s* 24220	1500 and under 1800	240	1 12⁄₁₆	55⅛	77⅛	370 1 22	75	1 1⁄₁₆	43 1 9	46 1 9	4	33	90	11	3½	26	9	7½
s 24220 and under *t* 27140	1800 and under 2100	240	1 13⁄₁₆	59⅛	82¾	397 3 6	75	1 2⁄₁₆	48 2 6	52 0 6	4¼	35	90	12	4	33	9½	7½
t 27140 and under *u* 30020	2100 and under 2400	240	1 14⁄₁₆	63¼	88 5⁄₁₀	425 1 0	75	1 2⁄₁₆	48 2 6	52 0 6	4¼	35	100	12	4	33	9½	8
u 30020 and under *v* 32820	2400 and under 2700	270	1 15⁄₁₆	67 1⁄₁₀	94 5⁄₁₀	511 1 14	90	1 2⁄₁₆	58 1 2	62 1 2	4¼	35	100	12	4	33	10	8½
v 32820 and under *w* 35450	2700 and under 3000	270	2	72	100 8⁄₁₀	538 3 0	90	1 3⁄₁₆	65 0 16	69 2 16	4½	39	120	12	4	33	10	8½
w 35450 and under *x* 39600	3000 and under 3500	270	2 1⁄₁₆	76 5⁄₁₀	107 1⁄₁₀	573 2 14	90	1 3⁄₁₆	65 0 16	69 2 16	4½	39	120	13	4½	39	10	9
x 39600 and under *y* 43600	3500 and under 4000	270	2 2⁄₁₆	81½	113¾	608 2 14	90	1 3⁄₁₆	65 0 16	69 2 16	4½	39	120	13	4½	39	11	9
y 43600 and under *z* 47400	4000 and under 4500	270	2 3⁄₁₆	86½	120 5⁄₁₀	645 3 0	90	1 4⁄₁₆	72 0 0	77 0 0	4¾	47	120	14	4¾	47	12	10
z 47400 and under *a*† 51000	4500 and under 5000	270	2 4⁄₁₆	91⅛	127 1⁄₁₀	682 1 11	90	1 4⁄₁₆	72 0 0	77 0 0	4¾	47	120	14	5	59	12	10
a† 51000 and under *b*† 55000	5000 and under 5500	270	2 5⁄₁₆	96¼	134¾	720 3 4	90	1 5⁄₁₆	79 2 5	85 0 5	5	59	120	15	5¼	65	12	10
b† 55000 and under *c*† 59000	5500 and under 6000	300	2 6⁄₁₆	101½	142 1⁄₁₀	844 1 0	120	1 5⁄₁₆	106 0 7	113 1 7	5	59	130	15	5½	71	13	11
c† 59000 and under *d*† 63000	6000 and under 6500	300	2 7⁄₁₆	107	149 7⁄₁₀	890 1 4	120	1 5⁄₁₆	106 0 7	113 1 7	5	59	130	15	5¾	78	13	11
d† 63000 and under 70000	6500 and under 7000	300	2 8⁄₁₆	112½	157 5⁄₁₀	936 0 3	120	1 6⁄₁₆	116 0 10	124 0 10	5¼	71	130	16	6	85	13	11

GROSS TONNAGE LESS CREW SPACE. See Note†	Numbers for IRON AND STEEL Vessels. See Footnote (a)
Tons.	
75 and under 112	*a* 2750 and under *b* 3750
112 and under 150	*b* 3750 and under *c* 4630
150 and under 188	*c* 4630 and under *d* 5420
188 and under 225	*d* 5420 and under *e* 6150
225 and under 262	*e* 6150 and under *f* 6840
262 and under 300	*f* 6840 and under *g* 7490
300 and under 375	*g* 7490 and under *h* 8670
375 and under 450	*h* 8670 and under *i* 9770
450 and under 525	*i* 9770 and under *j* 10790
525 and under 600	*j* 10790 and under *k* 11740
600 and under 675	*k* 11740 and under *l* 12620
675 and under 750	*l* 12620 and under *m* 13450
750 and under 900	*m* 13450 and under *n* 15120
900 and under 1050	*n* 15120 and under *o* 16720
1050 and under 1200	*o* 16720 and under *p* 18260
1200 and under 1350	*p* 18260 and under *q* 19780
1350 and under 1500	*q* 19780 and under *r* 21280
1500 and under 1800	*r* 21280 and under *s* 24220
1800 and under 2100	*s* 24220 and under *t* 27140
2100 and under 2400	*t* 27140 and under *u* 30020
2400 and under 2700	*u* 30020 and under *v* 32820
2700 and under 3000	*v* 32820 and under *w* 35450
3000 and under 3500	*w* 35450 and under *x* 39600
3500 and under 4000	*x* 39600 and under *y* 43600
4000 and under 4500	*y* 43600 and under *z* 47400
4500 and under 5000	*z* 47400 and under *a*† 51000
5000 and under 5500	*a*† 51000 and under *b*† 55000
5500 and under 6000	*b*† 55000 and under *c*† 59000
6000 and under 6500	*c*† 59000 and under *d*† 63000
6500 and under 7000	*d*† 63000 and under 70000

Equipment for SAILING AND STEAM TRAWLERS.

REGISTERED U.D. TONNAGE. Sailing Trawlers.	Steam Trawlers.	ANCHORS. No.	1st.	2nd.	3rd.	CHAIN (e) (f) (h). Length	Diameter	Minimum Weight. Stud Link.	Short Link.	HAWSERS. Length	Size.	WARPS. Length	Size.
			Cwts. ex. Stock.	Cwts. ex. Stock.	Cwts. ex. Stock.	Fathms.	Inches.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Fathms.	Ins.	Fathms.	Ins.
50 and under 65	65 and under 80	3	3	3	1⅜	60	1 2⁄₁₆	17 1 3	18 3 3	60	5	60	2½
65 and under 80	80 and under 100	3	3½	3½	2	60	1 3⁄₁₆	20 1 11	22 0 11	60	5½	60	3
80 and under 100	100 and under 120	3	4	4	2¼	60	1 4⁄₁₆	23 1 17	25 1 17	60	5½	60	3
100 and under 120	120 and under 140	3	4¼	4	2½	60	1 4⁄₁₆	23 1 17	25 1 17	60	5½	60	3½
120 and under 140	140 and under 160	3	4½	4	2½	75	1 5⁄₁₆	33 3 11	36 1 11	60	5½	60	3½
140	160 and under 180	3	4¾	4¼	2½	90	1 5⁄₁₆	40 2 13	43 2 13	60	5½	60	4

The Anchors and Chains to be tested at a Public Testing Machine in accordance with the statutory tests.

The following Machines are recognised by the Committee of Lloyd's Register for the Testing of Anchors and Chains while licensed by the Board of Trade for that purpose —

LONDON—Trinity Proving House.....Superintendent, Mr. L. R. Isitt.
Closed May, 1875.
*TIPTON—Lloyd's Proving House ..... ditto Mr. E. R. Isitt.
Assistant ditto Mr. H. Green.
*NETHERTON—Lloyd's Proving House ..... ditto Mr. D. G. Lewis.
Assistant ditto Mr. G. Horspool.
*LOW WALKER—Lloyd's Proving House ..... ditto Mr. C. E. Perrins.
*CHESTER (Saltney)—Lloyd's Proving House..... ditto Mr. A. S. Jack.
Assistant ditto Mr. J. Littler.
*GLASGOW—Lloyd's Proving House ..... ditto Mr. E. Seedhouse.
*CARDIFF—Lloyd's Proving House ..... ditto Mr. G. W. Penn.
SUNDERLAND—River Wear Commission, Public Test..... ditto Mr. J. Hartness.

And any other Machine will be recognised by the Committee which is or may be hereafter duly licensed by the Board of Trade for the purpose of testing Anchors and Chains.

N.B.—Vessels supplied with Anchors and Chain Cables tested at any of the Proving Machines marked with an asterisk (*) in the above list, will have the notation of "L.A.&C.P." in the Register Book, signifying that the Anchors and Chain Cables have been tested at a machine under the control of the Committee of Lloyd's Register of Shipping.

The following Proving Establishments have been recognised by the Committee for the testing of Anchors and Chain Cables supplied to foreign owned vessels (*see* Section 39 of the Rules for Iron and Steel Vessels.)

DENMARK ..... Government Establishment at Copenhagen.
FRANCE ..... Government Establishment at Raisines.
,, ... E. Turbot, Anzin (Nord).
,, ... Chantiers de la Loire, Nantes.
,, ... Vᵛᵉ E. Couillard, Succᵉ, Havre.
,, ... Dorémieux, Fils et Cie., St. Amand.
GERMANY ..... Hochfelder Walzwerk, Duisberg.
HOLLAND ..... Koninklijke Nederlandsche Grofsmederij at Leyden.
SWEDEN ..... Comptoir des Forges at Liljeholmen, near Stockholm.
UNITED STATES..... Messrs. Bradlee & Co.'s Works at Philadelphia.
,, ,, ... The Logan Iron and Steel Co. of Burnham, Pennsylvania.

N.B.—The Italic letters preceding the Equipment numbers correspond with letters printed in the seventh column in the List of Steam Vessels in the Register Book to indicate the Equipment numbers of vessels per this Table.

(a) By Section 39 of the Rules for the building and classification of Iron and Steel Vessels, it is provided that the equipment is to be regulated by the number produced by the sum of the measurements of the half-moulded breadth of the vessel at the middle of the length, the depth from the upper part of keel to the top of the upper deck beams, with the normal round up, and the girth of the half-midship frame section of the vessel, measured from the centre line at top of the keel to the upper deck stringer plate, multiplied by the length of the vessel, for a one, two, and three-decked vessel, and for a spar-decked vessel.

For a vessel having a complete awning-deck or a continuous shade deck, the equipment number is to be increased one-eighth beyond what it would be if the vessel were flush-decked.

For a vessel with a partial awning-deck, poop, topgallant forecastle, bridge-house, or a raised quarter-deck, the equipment number is to be increased beyond that for a flush or spar-deck vessel by that proportion of the addition made for a complete awning-deck which the combined length of the erections bears to the length of the vessel.

To entitle vessels classed A "For Channel Purposes" to the Figure 1, the equipment of Anchors and Chain Cables, etc., should be as required by Table 22, with the exception that not more than two bower anchors need be supplied, the first bower being of the greatest weight given in the table, and the second bower 15 per cent. lighter, the stream anchor only, being required. In vessels, however, engaged for more extended voyages, such as the Queenboro' and Flushing service, or the Channel Islands or Irish Sea, the equipment must be in accordance with the requirements of Table 22.

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the above Table may be modified as under :—

Where two Bower Anchors only are required, one of them may be 7½ per cent. lighter than the weight set forth above, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the three Anchors is equal to that given in Table, but in no case may the best Bower be lighter than prescribed in Table, nor the third Bower be lighter than is allowed by this footnote.

Where four Bower Anchors are required, one may be 15 per cent., and another 7½ per cent. lighter than the weight set forth above, provided the collective weight of the four Anchors is equal to that given in the Table, but two at least of the Bower Anchors must not be lighter than required by the Table.

All Anchor Stocks must be of acknowledged and approved description, and be one-fourth the weight of the anchor given in the Table.

The heads of Stockless anchors should not be less than three-fifths of the total weight of the Anchor.

(c) Stockless Stream and Kedge Anchors.—In the case of Stockless Stream and Kedge Anchors, an addition to the weight specified in this Table must be made of one-fourth to compensate for the deficiency in weight consequent on the absence of stock.

* The tests of anchors in this Table are approximate tests; or as near the Statutory tests as can be expressed in tons and aliquot parts of tons.

Tests for Cast Steel Anchors to be as per Circular No. 647.

(d) All Anchors, including Stream and Kedge Anchors, exceeding 168lbs. in weight, ex. Stock, to be Tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(e) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(f) There should be included in the above weights, 2 End Shackles to each Cable; that is 4 for each outfit, which contains two Cables.

(g) There should be included in the above weights, 2 End Shackles to each Stream Chain.

(h) Unstudded close-link Chains will be admitted as Cables, if proved to *two-thirds* the Test required for Stud-link Chains for the *tensile* strain, and 100 per cent. above the *tensile* strain for the breaking strain.

(i) When steel wire Towlines or Hawsers are adopted, see note i on the other side of this Table.

Where a departure from the requirements of the Table for Hawsers and Warps is proposed the same should be in all cases submitted in the first place for the approval of the Committee.

Lloyd's Register of Shipping, 2, *White Lion Court, Cornhill.*
13*th April*, 1893.

STEEL VESSELS.

Table of Minimum Dimensions of FRAMES,

NUMBERS. For Frames, Reversed Frames, Bulkheads, and Pillars. *(See Section 2.)*	SPACING OF FRAMES.	FRAMES.		Reversed Frames.	Dimensions of ⌐ and Channel bar Frames for three-fifths length amidships.	Bulkheads.	
		Dimensions of angles for three-fifths the length of vessel amidships, and bulkheads.	Dimensions of angles before and abaft the three-fifths length.	Dimensions of Reversed angles all fore and aft.		Lower Halt.	Upper Half.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
31 and under 37	20	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{4} \times 2\frac{1}{4} \times \frac{5}{20}$	...	$\frac{5}{20}$	$\frac{5}{20}$
37 and under 45	21	$3 \times 2\frac{1}{2} \times \frac{5}{20}$	$3 \times 2\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	...	$\frac{5}{20}$	$\frac{5}{20}$
45 and under 52	21	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	...	$\frac{5}{20}$	$\frac{5}{20}$
52 and under 57	22	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3\frac{1}{2} \times 3 \times \frac{5}{20}$	$3 \times 2\frac{1}{2} \times \frac{5}{20}$	$3\frac{1}{2} \times 3 \times 3 \times \frac{7}{20}$	$\frac{6}{20}$	$\frac{5}{20}$
57 and under 61	22	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$	$3\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$	$\frac{6}{20}$	$\frac{5}{20}$
61 and under 65	23	$4 \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$4 \times 3 \times 3 \times \frac{8}{20}$	$\frac{6}{20}$	$\frac{6}{20}$
65 and under 68	23	$4 \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$	$4 \times 3 \times 3 \times \frac{8}{20}$	$\frac{6}{20}$	$\frac{6}{20}$
68 and under 71	23	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$	$\frac{6}{20}$	$\frac{6}{20}$
71 and under 73	24	$4\frac{1}{2} \times 3 \times \frac{8}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times 3 \times \frac{9}{20}$	$\frac{6}{20}$	$\frac{6}{20}$
73 and under 76	24	$5 \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$5 \times 3 \times 3 \times \frac{9}{20}$	$\frac{6}{20}$	$\frac{6}{20}$
76 and under 80	24	$5 \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3 \times \frac{8}{20}$	$5 \times 3 \times 3 \times \frac{10}{20}$	$\frac{7}{20}$	$\frac{6}{20}$
80 and under 85	24	$5 \times 3\frac{1}{2} \times \frac{8}{20}$	$5 \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$5 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$\frac{7}{20}$	$\frac{6}{20}$
85 and under 91	24	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$4 \times 3\frac{1}{2} \times \frac{8}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$\frac{7}{20}$	$\frac{6}{20}$
91 and under 97	24	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$4 \times 3\frac{1}{2} \times \frac{9}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$	$\frac{7}{20}$	$\frac{6}{20}$
97 and under 103	25	$6 \times 3\frac{1}{2} \times \frac{10}{20}$	$6 \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$6 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$\frac{8}{20}$	$\frac{7}{20}$
103 and under 109	25	$6 \times 3\frac{1}{2} \times \frac{10}{20}$	$6 \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$\frac{8}{20}$	$\frac{7}{20}$
109 and under 115	26	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 4 \times \frac{10}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$\frac{8}{20}$	$\frac{7}{20}$
115 and under 120	26	$7 \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 4 \times \frac{10}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$	$\frac{8}{20}$	$\frac{7}{20}$

MEMO.:—Wider spacing than the above may be adopted provided the

The thickness given for Channel or ⌐ Sections is t

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15th December, 1892.

Diameter of Solid pillars, and diameter and thickness of hollow malleable pillars to beams.			
Solid Pillars.		Hollow malleable Pillars.	
ld.	'Tween dk. poop, bridge, and forecastle.	Hold.	'Tween deck poop, bridge, and forecastle.
es.	inches.	inches.	inches.
.	$2\frac{1}{4}$	...	$3 \times \frac{5}{16}$
..	$2\frac{1}{2}$	...	$3\frac{1}{4} \times \frac{5}{16}$
$\frac{1}{2}$	$2\frac{3}{8}$	$3\frac{1}{4} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{5}{16}$
$\frac{5}{8}$	$2\frac{3}{8}$	$3\frac{1}{2} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{5}{16}$
$\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{3}{4} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$
$\frac{7}{8}$	$2\frac{1}{2}$	$3\frac{7}{8} \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$
3	$2\frac{1}{2}$	$4 \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$
$3\frac{1}{8}$	$2\frac{5}{8}$	$4 \times \frac{7}{16}$	$3\frac{1}{2} \times \frac{6}{16}$
$3\frac{1}{4}$	$2\frac{5}{8}$	$4\frac{1}{8} \times \frac{7}{16}$	$3\frac{1}{2} \times \frac{6}{16}$
$3\frac{3}{8}$	$2\frac{5}{8}$	$4\frac{1}{4} \times \frac{7}{16}$	$3\frac{1}{2} \times \frac{6}{16}$
$3\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{1}{2} \times \frac{7}{16}$	$3\frac{3}{4} \times \frac{6}{16}$
$3\frac{5}{8}$	$2\frac{3}{4}$	$4\frac{3}{4} \times \frac{7}{16}$	$3\frac{3}{4} \times \frac{6}{16}$
$3\frac{5}{8}$	$2\frac{3}{4}$	$4\frac{3}{4} \times \frac{7}{16}$	$3\frac{3}{4} \times \frac{6}{16}$
$3\frac{3}{4}$	$2\frac{7}{8}$	$5 \times \frac{7}{16}$	$3\frac{7}{8} \times \frac{6}{16}$
$3\frac{3}{4}$	$2\frac{7}{8}$	$5 \times \frac{7}{16}$	$3\frac{7}{8} \times \frac{6}{16}$
4	3	$5\frac{1}{2} \times \frac{7}{16}$	$4 \times \frac{6}{16}$
$4\frac{1}{4}$	3	$5\frac{3}{4} \times \frac{7}{16}$	$4 \times \frac{6}{16}$
$4\frac{1}{2}$	$3\frac{1}{4}$	$6 \times \frac{7}{16}$	$4\frac{1}{8} \times \frac{7}{16}$

TABLE FOR SIZES OF FLOORS.

Floor plates in engine space of steam vessels to be $\frac{1}{20}$ of an inch thicker, and in the boiler space $\frac{2}{20}$ of an inch thicker than in this Table.

NUMBERS FOR FLOORS. (*See Section 2.*)	For three-fifths length amidships.	Thickness at Ends.
	inches.	inches.
31 and under 32	$9 \times \frac{5}{20}$	$\frac{5}{20}$
32 and under 33	$9\frac{1}{2} \times \frac{5}{20}$	$\frac{5}{20}$
33 and under 34	$10 \times \frac{5}{20}$	$\frac{5}{20}$
34 and under 35	$10\frac{1}{2} \times \frac{5}{20}$	$\frac{5}{20}$
35 and under 37	$11 \times \frac{5}{20}$	$\frac{5}{20}$
37 and under 39	$11\frac{1}{2} \times \frac{5}{20}$	$\frac{5}{20}$
39 and under 41	$12 \times \frac{5}{20}$	$\frac{5}{20}$
41 and under 43	$12 \times \frac{6}{20}$	$\frac{5}{20}$
43 and under 45	$12\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$
45 and under 47	$13 \times \frac{6}{20}$	$\frac{5}{20}$
47 and under 49	$13\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$
49 and under 51	$14 \times \frac{6}{20}$	$\frac{5}{20}$
51 and under 52	$14\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$
52 and under 53	$15 \times \frac{6}{20}$	$\frac{5}{20}$
53 and under 55	$15\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$
55 and under 56	$15\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$
56 and under 57	$16 \times \frac{7}{20}$	$\frac{6}{20}$
57 and under 58	$16\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$
58 and under 59	$17 \times \frac{7}{20}$	$\frac{6}{20}$
59 and under 60	$17\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$
60 and under 62	$17\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$
62 and under 63	$18 \times \frac{8}{20}$	$\frac{7}{20}$
63 and under 64	$18\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$
64 and under 65	$19 \times \frac{8}{20}$	$\frac{7}{20}$
65 and under 66	$19\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$

NUMBERS FOR FLOORS—continued. (*See Section 2.*)	For three-fifths length amidships.	Thickness at Ends.
	inches.	inches.
66 and under 67	$20 \times \frac{8}{20}$	$\frac{7}{20}$
67 and under 68	$20\frac{1}{2} \times \frac{8}{80}$	$\frac{7}{20}$
68 and under 69	$21 \times \frac{8}{80}$	$\frac{7}{20}$
69 and under 70	$21 \times \frac{9}{20}$	$\frac{7}{20}$
70 and under 71	$21\frac{1}{2} \times \frac{9}{20}$	$\frac{7}{20}$
71 and under 72	$22 \times \frac{9}{20}$	$\frac{7}{20}$
72 and under 73	$22\frac{1}{2} \times \frac{9}{20}$	$\frac{7}{20}$
73 and under 74	$23 \times \frac{9}{20}$	$\frac{7}{20}$
74 and under 76	$23\frac{1}{2} \times \frac{9}{20}$	$\frac{7}{20}$
76 and under 78	$24 \times \frac{9}{20}$	$\frac{7}{20}$
78 and under 80	$24 \times \frac{10}{20}$	$\frac{8}{20}$
80 and under 84	$24\frac{1}{2} \times \frac{10}{20}$	$\frac{8}{20}$
84 and under 88	$25 \times \frac{10}{20}$	$\frac{8}{20}$
88 and under 90	$26 \times \frac{10}{20}$	$\frac{8}{20}$
90 and under 92	$27 \times \frac{10}{20}$	$\frac{8}{20}$
92 and under 95	$28 \times \frac{10}{20}$	$\frac{8}{20}$
95 and under 98	$29 \times \frac{10}{20}$	$\frac{8}{20}$
98 and under 101	$30 \times \frac{10}{20}$	$\frac{8}{20}$
101 and under 105	$31 \times \frac{10}{20}$	$\frac{8}{20}$
105 and under 108	$32 \times \frac{10}{20}$	$\frac{8}{20}$
108 and under 110	$33 \times \frac{10}{20}$	$\frac{8}{20}$
110 and under 113	$34 \times \frac{10}{20}$	$\frac{8}{20}$
113 and under 116	$35 \times \frac{10}{20}$	$\frac{8}{20}$
116 and under 120	$36 \times \frac{10}{20}$	$\frac{8}{20}$

framing and plating be increased in size to the satisfaction of the Committee.

be the minimum thickness of both webs and flanges.

STEEL VESSELS.

Table of Minimum Dimensions of KEELS, STEMS,

NUMBERS. For Keel, Stem, Sternpost, and Plating. *(See Section 2.)*	Bar Keels for All Grades.	Stem of Sailing Vessels, and Steamers, and Sternpost of Sailing Vessels and Paddle Steamers.	Stern frames of Screw Steamers.	THICKNESS OF					
				Flat Plate Keels for all grades, breadth, and thickness.		Garboard Strakes, breadth and thickness.			
						100A		90A	
				Three-fifths length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.
	inches.	inches.	inches.	inches.		inches.		inches.	
2600 and under 3300	6 × 1 1/8	5 1/2 × 1 1/8	5 1/4 × 2 1/4	30 × 8	6	30 × 6	6	30 × 6	6
3300 and under 4200	6 1/2 × 1 1/8	5 3/4 × 1 1/8	5 3/4 × 2 1/2	30 × 8	6	30 × 7	7	30 × 6	6
4200 and under 5100	6 3/4 × 1 1/4	6 × 1 1/4	6 × 2 1/2	30 × 9	7	30 × 7	7	30 × 6	6
5100 and under 6000	7 × 1 3/8	6 × 1 3/8	6 × 3	31 × 9	8	31 × 8	8	31 × 7	7
6000 and under 6900	7 × 1 1/2	6 1/4 × 1 1/2	6 1/4 × 3	31 × 10	8	31 × 8	8	31 × 7	7
6900 and under 7700	7 × 1 5/8	6 1/4 × 1 5/8	6 1/2 × 3 1/4	31 × 11	8	31 × 9	8	31 × 8	8
7700 and under 8500	7 × 1 3/4	6 1/2 × 1 3/4	6 1/2 × 3 1/2	31 × 12	9	31 × 9	8	31 × 8	8
8500 and under 9300	7 1/4 × 1 7/8	6 1/2 × 1 7/8	6 1/2 × 3 3/4	32 × 12	9	32 × 9	8	32 × 8	8
9300 and under 10100	7 1/2 × 1 7/8	6 3/4 × 1 7/8	6 3/4 × 4	32 × 12	9	32 × 9	8	32 × 8	8
10100 and under 10900	7 1/2 × 2	6 3/4 × 2	6 3/4 × 4 1/4	32 × 12	9	32 × 9	8	32 × 8	8
10900 and under 11600	7 1/2 × 2 1/8	7 × 2 1/8	7 × 4 1/4	33 × 12	9	33 × 9	8	33 × 8	8
11600 and under 12400	7 1/2 × 2 1/4	7 × 2 1/4	7 × 4 1/2	33 × 12	9	33 × 10	9	33 × 9	8
12400 and under 13100	8 × 2 1/4	7 × 2 1/4	7 × 4 3/4	33 × 13	10	33 × 10	9	33 × 9	8
13100 and under 13900	8 × 2 1/4	7 × 2 1/4	7 1/4 × 4 3/4	34 × 13	10	34 × 10	9	34 × 9	8
13900 and under 14700	8 × 2 3/8	7 1/4 × 2 3/8	7 1/2 × 4 3/4	34 × 14	11	34 × 11	10	34 × 10	9
14700 and under 15600	8 × 2 3/8	7 1/2 × 2 3/8	8 × 4 3/4	35 × 14	11	35 × 11	10	35 × 10	9
15600 and under 16600	8 1/2 × 2 3/8	8 × 2 3/8	8 × 5	36 × 14	11	36 × 11	10	36 × 10	9
16600 and under 17600	9 × 2 3/8	8 1/2 × 2 3/8	8 1/2 × 5	36 × 14	11	36 × 11	10	36 × 10	9
17600 and under 18700	9 × 2 1/2	8 1/2 × 2 1/2	8 1/2 × 5	36 × 16	12	36 × 12	11	36 × 11	10

OUTSIDE PLATING IN $\frac{1}{20}$THS. OF AN INCH.

From Garboard to the lower edge of Sheerstrake.*				Sheerstrakes for all grades, breadth, and thickness.		From main to upper Sheerstrake in Spar-decked vessels.		Spar deck Sheerstrake, breadth and thickness.		Awning deck and Bridge Side Plating, also Poops, and Forecastles.
100A		90A								
Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	
				inches.						
5 & 6	5	5	5	30 × 6	5	...	...	...	...	...
6	5	5 & 6	5	30 × 7	6	...	...	...	...	...
6 (*a*)	5	5 & 6 (*a*)	5	31 × 7	6	...	...	...	...	...
6 & 7	5 & 6	6	5	31 × 8	7	...	...	...	...	...
6 & 7 (*a*)	5 & 6	6 (*a*)	5	32 × 8	7	...	...	...	...	...
7	6	6 & 7	5 & 6	32 × 9	8	...	...	...	...	...
7 (*a*)	6	6 & 7 (*a*)	5 & 6	33 × 9	8	...	...	...	...	...
7 & 8	6 & 7	7	6	33 × 10	8	...	...	...	...	...
7 & 8 (*b*)	6 & 7	7 (*b*)	6	34 × 10	8	...	...	...	...	...
8	7	7 & 8	6 & 7	34 × 10	8	...	...	...	...	5
8 (*b*)	7	7 & 8 (*b*)	6 & 7	35 × 10	8	...	...	...	...	5
8 & 9	7 & 8	8	7	35 × 10	8	...	...	...	...	5
8 & 9 (*b*)	7 & 8	8 (*b*)	7	36 × 10	8	...	...	...	...	5
9	8	8 & 9	7 & 8	36 × 11	9	7	6	36 × 9	8	6
9 (*b*)	8	8 & 9 (*b*)	7 & 8	38 × 11	9	7	6	38 × 9	8	6
9 & 10	8	9	8	38 × 11	9	7	6	38 × 9	8	6
9 & 10 (*b*)	8	9 (*b*)	8	40 × 12	9	8	7	40 × 10	8	6
10	8	9 & 10	8	40 × 12	9	8	7	40 × 10	8	6
10 (*b*)	8	9 & 10 (*b*)	8	42 × 13	10	8	7	40 × 11	9	6

For foot notes—*see continuation.*

STEEL VESSELS.

Table of Minimum Dimensions of KEELS,

NUMBERS. For Keel, Stem, Sternpost, and Plating. *(See Section 2.)*	Bar Keels for All Grades.	Stem or Sailing Vessels, and Steamers, and Sternpost of Sailing Vessels and Paddle Steamers.	Stern frames of Screw Steamers.	THICKNESS OF					
				Flat Plate Keels for all grades, breadth, and thickness.		Garboard Strakes, breadth and thickness.			
						100A		90A	
				Three-fifths length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.
	inches.	inches.	inches.	inches.		inches.		inches.	
18700 and under 19900	$9\frac{1}{2} \times 2\frac{1}{2}$	9 $\times 2\frac{1}{2}$	9 $\times 5$	36×16	12	36×12	11	...	...
19900 and under 21300	$9\frac{1}{2} \times 2\frac{1}{2}$	9 $\times 2\frac{1}{2}$	9 $\times 5\frac{1}{2}$	36×16	12	36×12	11	...	...
21300 and under 22900	10 $\times 2\frac{1}{2}$	10 $\times 2\frac{1}{2}$	10 $\times 5\frac{1}{2}$	36×16	12	36×12	11	...	...
22900 and under 24600	10 $\times 2\frac{5}{8}$	10 $\times 2\frac{5}{8}$	10 $\times 6$	36×16	12	36×12	11	...	...
24600 and under 26500	10 $\times 2\frac{3}{4}$	10 $\times 2\frac{3}{4}$	10 $\times 6$	36×16	12	36×12	11	...	...
26500 and under 28700	$10\frac{1}{2} \times 2\frac{3}{4}$	$10\frac{1}{2} \times 2\frac{3}{4}$	11 $\times 6$	36×16	12	36×12	11	...	...
28700 and under 31200	11 $\times 2\frac{3}{4}$	11 $\times 2\frac{3}{4}$	11 $\times 6\frac{1}{2}$	36×17	13	36×13	12	...	...
31200 and under 33900	11 $\times 2\frac{7}{8}$	11 $\times 2\frac{7}{8}$	11 $\times 6\frac{3}{4}$	36×17	13	36×13	12	...	...
33900 and under 36800	11 $\times 3$	11 $\times 3$	11 $\times 7$	36×18	14	36×14	13	...	...
36800 and under 40000	11 $\times 3\frac{1}{8}$	11 $\times 3\frac{1}{8}$	11 $\times 7\frac{1}{2}$	36×18	14	36×14	13	...	...
40000 and under 43400	$11\frac{1}{2} \times 3\frac{1}{8}$	$11\frac{1}{2} \times 3\frac{1}{8}$	$11\frac{1}{2} \times 7\frac{1}{2}$	36×18	14	36×14	13	...	...
43400 and under 47100	12 $\times 3\frac{1}{8}$	12 $\times 3\frac{1}{8}$	12 $\times 7\frac{3}{4}$	36×18	14	36×14	13	...	...
47100 and under 51000	12 $\times 3\frac{1}{4}$	12 $\times 3\frac{1}{4}$	$12\frac{1}{2} \times 7\frac{3}{4}$	36×20	15	36×15	14	...	...
51000 and under 55200	12 $\times 3\frac{3}{8}$	12 $\times 3\frac{3}{8}$	13 $\times 8$	36×20	15	36×15	14	...	...
55200 and under 59700	12 $\times 3\frac{1}{2}$	12 $\times 3\frac{1}{2}$	13 $\times 8\frac{1}{2}$	36×20	15	36×15	14	...	...
59700 and under 64600	12 $\times 3\frac{5}{8}$	12 $\times 3\frac{5}{8}$	13 $\times 9$	36×20	15	36×15	14	...	...
64600 and under 70000	12 $\times 3\frac{3}{4}$	12 $\times 3\frac{3}{4}$	13 $\times 9\frac{1}{2}$	36×21	16	36×16	15	...	...

MEM.—The Scantlings given in the above Table are intended for Vessels the length of which does not exceed *eleven times* their depth *from top of keel*, see Section 1. For Vessels which exceed this proportion, *see Section* 46 *and Table S* 6. For proportions of breadth to length, *see Table S* 5.

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29th November, 1888.

TABLE S 2.

(Continued).

OUTSIDE PLATING IN $\frac{1}{20}$THS. OF AN INCH

From Garboard to the lower edge of Sheerstrake.*				Sheerstrakes for all grades, breadth, and thickness.		From main to upper Sheerstrake in Spar-decked vessels.		Spar deck Sheerstrake, breadth and thickness.		Awning deck and Bridge Side Plating, also Poops, and Forecastles.
100A		90A								
Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	
				inches.						
10 & 11	8 & 9	...	...	42 × 13	10	8	7	40 × 11	9	7
10 & 11 (*b*)	8 & 9	...	...	42 × 13	10	8	7	40 × 11	9	7
11	9	...	...	42 × 13	10	8	7	40 × 11	9	7
11 (*b*)	9	...	...	42 × 13	10	8	7	40 × 11	9	7
11 & 12	9	...	...	42 × 13	10	8	7	40 × 11	9	7
11 & 12 (*c*)	9	...	...	44 × 13	10	8	7	40 × 11	9	7
12	9	...	...	44 × 13	10	9	8	40 × 11	9	7
12 (*c*)	9	...	...	44 × 13	10	9	8	40 × 11	9	7
12 & 13	9 & 10	...	...	44 × 14	11	9	8	40 × 12	9	7
12 & 13 (*c*)	9 & 10	...	...	44 × 14	11	9	8	40 × 12	9	7
13	10	...	...	44 × 14	11	9	8	40 × 12	9	7
13 (*c*)	10	...	...	46 × 15	12	9	8	40 × 13	10	...
13 & 14	10 & 11	...	...	46 × 15	12	9	8	40 × 13	10	...
13 & 14 (*c*)	10 & 11	...	...	46 × 16	13	9	8	40 × 14	11	...
14	11	...	...	46 × 16	13	9	8	40 × 14	11	...
14 (*c*)	11	...	...	46 × 16	13	9	8	40 × 14	11	...
14 & 15	11 & 12	...	...	46 × 16	13	9	8	40 × 14	11	...

* In the columns for plating, where two thicknesses are given they are to be worked in alternate strakes, and the larger thickness is to apply to the outer strakes, and the smaller one to the inner strakes: and the size of the rivets and double riveting to be regulated by the thickness of the thicker plating.

(*a*). One strake at Bilge increased $\frac{1}{20}$ of an inch in thickness all fore and aft.

(*b*). Two strakes " " $\frac{1}{20}$ " " " " "

(*c*). Three " " " $\frac{1}{20}$ " " " " "

STEEL VESSELS.

Table of Minimum Dimensions of KEELSONS, KEELSON AND

NUMBERS. To regulate keelsons stringers, decks, rudders, and ceiling. (*See Section* 2.)	Size of middle-line keelsons standing upon floors, and thickness of rider plate to keelson.		Thickness of intercostal keelson plates.	Dimensions of angle bars for keelsons, and stringers in hold, for all grades.	Dimensions of angle bar on the middle, lower or hold, and orlop beam stringer plates, on upper deck stringer plates in spar-decked, and awning-decked vessels.	Dimensions of angle bars on upper deck stringer plates.
	Half length amidships.	Thickness at ends.				
	inches.	inches.	inches.	inches.	inches.	inches.
Under 2800	$7\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
2800 and under 4100	$8\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
4100 and under 5400	$9 \times \frac{8}{20}$	$\frac{7}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
5400 and under 6700	$10 \times \frac{8}{20}$	$\frac{7}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
6700 and under 7900	$11 \times \frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$
7900 and under 9100	$12 \times \frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$
9100 and under 10300	$12 \times \frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$4 \times 3 \times \frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
10300 and under 11400	$12 \times \frac{10}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
11400 and under 12600	$13 \times \frac{10}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$4 \times 4 \times \frac{7}{20}$
12600 and under 13800	$14 \times \frac{11}{20}$	$\frac{9}{20}$	$\frac{7}{20}$	$5 \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$4 \times 4 \times \frac{8}{20}$
13800 and under 15100	$15 \times \frac{11}{20}$	$\frac{9}{20}$	$\frac{7}{20}$	$5 \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$4 \times 4 \times \frac{8}{20}$
15100 and under 16500	$16 \times \frac{12}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$5 \times 3\frac{1}{2} \times \frac{9}{20}$	$4 \times 4 \times \frac{8}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
16500 and under 18000	$17 \times \frac{12}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$5 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
18000 and under 19700	$18 \times \frac{13}{20}$	$\frac{11}{20}$	$\frac{8}{20}$	$5\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
19700 and under 21700	$19 \times \frac{13}{20}$	$\frac{11}{20}$	$\frac{8}{20}$	$5\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
21700 and under 24100	$20 \times \frac{13}{20}$	$\frac{11}{20}$	$\frac{9}{20}$	$6 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$
24100 and under 27000	$20 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$
27000 and under 30400	$22 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$
30400 and under 34300	$23 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$
34300 and under 38800	$25 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$
38800 and under 43900	$27 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
43900 and under 49600	$29 \times \frac{14}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
49600 and under 56000	$30 \times \frac{15}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
56000 and under 63000	$32 \times \frac{15}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
63000 and under 70000	$32 \times \frac{15}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$

STRINGER ANGLES, DECKS, RUDDERS, AND CEILING.

RUDDER.*				Thickness of Upper Deck. (*a*)		Thickness of wood ceiling in hold, to upper part of bilges.	NUMBERS. To regulate keelsons, stringers, decks, rudders, and ceiling. (*See Section* 2.)
Sailing Vessels.		Steam Vessels.					
Diameter at the head.	Diameter at the heel & pintle.	Diameter at the head.	Diameter at the heel & pintle.	Wood	Steel.		
inches.	inches.	inches.	inches.	inches.	inches.	inches.	
$2\frac{7}{8}$	2	3	2	$2\frac{1}{2}$	...	2	Under 2800
3	2	$3\frac{1}{2}$	2	3	...	2	2800 and under 4100
$3\frac{1}{4}$	2	$3\frac{3}{4}$	$2\frac{1}{4}$	3	...	2	4100 and under 5400
$3\frac{1}{2}$	2	4	$2\frac{1}{4}$	3	$\frac{6}{20}$	2	5400 and under 6700
$3\frac{3}{4}$	$2\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	6700 and under 7900
4	$2\frac{1}{4}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	7900 and under 9100
$4\frac{1}{4}$	$2\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	9100 and under 10300
$4\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	10300 and under 11400
$4\frac{3}{4}$	$2\frac{3}{4}$	5	3	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	11400 and under 12600
5	3	$5\frac{1}{4}$	3	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	12600 and under 13800
$5\frac{1}{4}$	3	$5\frac{1}{2}$	3	$3\frac{1}{2}$	$\frac{6}{20}$	$2\frac{1}{2}$	13800 and under 15100
$5\frac{1}{2}$	3	$5\frac{3}{4}$	3	4	$\frac{6}{20}$	$2\frac{1}{2}$	15100 and under 16500
6	3	$6\frac{1}{4}$	$3\frac{1}{4}$	4	$\frac{6}{20}$	$2\frac{1}{2}$	16500 and under 18000
$6\frac{1}{4}$	$3\frac{1}{4}$	7	$3\frac{1}{2}$	4	$\frac{6}{20}$	$2\frac{1}{2}$	18000 and under 19700
$6\frac{3}{4}$	$3\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	4	$\frac{6}{20}$	$2\frac{1}{2}$	19700 and under 21700
7	$3\frac{1}{2}$	$7\frac{3}{4}$	$3\frac{3}{4}$	4	$\frac{6}{20}$	$2\frac{1}{2}$	21700 and under 24100
$7\frac{1}{2}$	$3\frac{3}{4}$	8	4	4	$\frac{6}{20}$	$2\frac{1}{2}$	24100 and under 27000
$7\frac{1}{2}$	$3\frac{3}{4}$	$8\frac{1}{2}$	$4\frac{1}{4}$	4	$\frac{7}{20}$	$2\frac{1}{2}$	27000 and under 30400
8	4	9	$4\frac{1}{2}$	4	...	$2\frac{1}{2}$	30400 and under 34300
$8\frac{1}{2}$	$4\frac{1}{2}$	$9\frac{1}{2}$	$4\frac{3}{4}$	4	...	$2\frac{1}{2}$	34300 and under 38800
...	...	10	5	4	...	$2\frac{1}{2}$	38800 and under 43900
...	...	$10\frac{1}{2}$	$5\frac{1}{4}$	4	...	$2\frac{1}{2}$	43900 and under 49600
...	...	$10\frac{1}{2}$	$5\frac{1}{4}$	4	...	$2\frac{1}{2}$	49600 and under 56000
...	...	11	$5\frac{1}{2}$	4	...	$2\frac{1}{2}$	56000 and under 63000
...	...	11	$5\frac{1}{2}$	4	...	$2\frac{1}{2}$	63000 and under 70000

* *See* also Sections 36 and 42.

(*a*) When the deck is of Teak, it may be one-sixth less in thickness. Where a steel deck is substituted for a wood one, it is not to be less than as given above, and supported by beams as in the case of steel decks required by Table S 5. When the deck is of steel as required by the Rules, it is to be in thickness as given in Table S 5.

DIAMETER OF NUT AND SCREW BOLTS FOR FASTENING FLAT OF DECK.	
3 ins. and under $3\frac{1}{2}$ ins....	$\frac{1}{2}$ inch.
$3\frac{1}{2}$,, ,, 4 ,, ...	$\frac{9}{16}$,,
4 inches	$\frac{5}{8}$,,

MEM.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed *eleven times* their depth *from top of keel, see Section* 1. *For Vessels which exceed this proportion, see Section* 46 *and Table S* 6. *For proportions of breadth to length, see Table S* 5.

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STEEL VESSELS.

Length of Beam amidships.	Upper and Lower Deck Beams in one and two decked vessels, Main and Lower Deck Beams in "Three deck" and spar-decked Vessels, and Beams of raised quarter decks.				Upper Deck Beams in "Three-deck" Vessels. (*d*)				Size of Spar-deck Beams (*a*) all for and aft, and Forecastle Beams.
	Size of Beams amidships.		Size of Beams less than three-fourths the length of the midship Beam.		Size of Beams amidships.		Size of Beams less than three-fourths the length of the midship Beam.		
Feet.	Bulb Plate. ins. ins.	Single Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.
16		$4\frac{1}{2} \times 3 \times \frac{6}{20}$							
18		$5 \times 3 \times \frac{7}{20}$							
20	$5 \times \frac{5}{20}$ Sng. Ang. Bar	Double Angle Bars $2 \times 2 \times \frac{5}{20}$ $5\frac{1}{2} \times 3 \times \frac{7}{20}$							
22	$5\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{4} \times \frac{5}{20}$							
24	$6 \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	$5\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$					
26	$6\frac{1}{2} \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$	$6 \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$	$6 \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$			$5\frac{1}{2} \times \frac{5}{20}$
28	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$	$6 \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$	$6 \times \frac{6}{20}$
30	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$
32	$8 \times \frac{8}{20}$	$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$
34	$8\frac{1}{2} \times \frac{8}{20}$	$3 \times 3 \times \frac{7}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$
36	$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$	$3 \times 3 \times \frac{6}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$7\frac{1}{2} \times \frac{7}{20}$
38	$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$
40	$10 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$
42	$10\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times \frac{9}{20}$
44	$11 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9\frac{1}{2} \times \frac{9}{20}$
46	$11\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$9\frac{1}{2} \times \frac{9}{20}$
48	$12 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$
50	$12 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$11 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10\frac{1}{2} \times \frac{10}{20}$

The size of all beams (with the exception of those of spar decks, awning decks, poops and forecastles), which are not less in length than three-fourths of the length of the midship beam, to be of the size given above for beams amidships; those of less length may be of the size given above, excepting those at hatchways exceeding in length four spaces of frames, mast and windlass beams, and beams under deck houses and the heel of bowsprit, which must not be less in size than the midship beam.

Strong beams in the machinery space must in all cases have double angle bars on their upper and lower edges.

No reduction is admitted at the ends of vessels in the size of spar and awning deck beams, and beams of poops and forecastles from those given above.

Where a poop, bridge, or forecastle is fitted on a spar deck, the beams may be one grade smaller than given above for poop, bridge, and forecastle beams.

The beams to fore and after peak tanks to be fitted to every frame, and to be of the size required for main deck beams at the ends of the vessel.

Butterley beams, when substituted for bulb plate and double angles, may, except in the case of wide spaced strong hold beams be of the depth and thickness given for bulb beams in Table.

LLOYD'S REGISTER OF SHIPPING, 2, WHITE LION COURT, CORNHILL, LONDON, E.C.

28th April, 1892.

BEAMS.

TABLE S 4.

Size of Spar-deck Beams (*a*) all fore and aft, and Fore-castle Beams.	Size of Awning Deck Beams, Poop Beams, and Bridge Beams (*a*).		Hold Beams (*b*) of Extra Strength.		Beams on every frame where Steel or Iron Decks are fitted (*c*).		
					One, two & "Three deck" Vessels.	Spar deck.	Poop, Awning deck, Bridge, and Forecastle (*d*)
Double Angle Bars. ins. ins. ins.	Bulb Plate. ins. ins.	Single Angle Bars. ins. ins. ins.	Plate or Bulb Plate. ins. ins.	Size of Angle Bars. ins. ins. ins.	Single Angle Bars. ins. ins. ins.	Single Angle Bars. ins. ins. ins.	Single Angle Bars. ins. ins. ins.
$4\frac{1}{2} \times 3 \times \frac{7}{20}$ Single Angle.							
$5 \times 3 \times \frac{7}{20}$ Single Angle.		$4\frac{1}{2} \times 3 \times \frac{6}{20}$			$4 \times 2\frac{1}{2} \times \frac{6}{20}$		
$5\frac{1}{2} \times 3 \times \frac{7}{20}$ Single Angle.		$5 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$5 \times 3 \times \frac{6}{20}$	$4 \times 2\frac{1}{2} \times \frac{6}{20}$	
$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$		$5 \times 3 \times \frac{7}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$5 \times 3 \times \frac{7}{20}$	$5 \times 3 \times \frac{6}{20}$	
$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$		$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$	$4 \times 3 \times \frac{7}{20}$	$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$5 \times 3 \times \frac{7}{20}$	$4 \times 2\frac{1}{2} \times \frac{6}{20}$
$3 \times 2\frac{1}{2} \times \frac{5}{20}$		$6 \times 3 \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$4 \times 3 \times \frac{7}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{6}{20}$
$3 \times 3 \times \frac{5}{20}$		$6\frac{1}{2} \times 3 \times \frac{8}{20}$	$9 \times \frac{9}{20}$	$4 \times 3\frac{1}{2} \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$ Bulb Angle.	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{6}{20}$
$3 \times 3 \times \frac{6}{20}$	$6 \times \frac{6}{20}$ Bulb Angle.	Double Angle Bars. $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$ $6\frac{1}{2} \times 3 \times \frac{8}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$4 \times 4 \times \frac{8}{20}$	$6 \times 3 \times \frac{8}{20}$ Bulb Angle.	$5\frac{1}{2} \times 3 \times \frac{8}{20}$ Bulb Angle.	$5 \times 3 \times \frac{7}{20}$
$3 \times 3 \times \frac{6}{20}$	$6\frac{1}{2} \times \frac{6}{20}$ Bulb Angle.	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{20}$ $7 \times 3 \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$6\frac{1}{2} \times 3 \times \frac{9}{20}$ Bulb Angle.	$6 \times 3 \times \frac{8}{20}$ Bulb Angle.	$5\frac{1}{2} \times 3 \times \frac{7}{20}$
$3 \times 3 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$	$10\frac{1}{2} \times \frac{10}{20}$	$4\frac{1}{2} \times 4 \times \frac{9}{20}$	$7\frac{1}{2} \times 3 \times \frac{9}{20}$ Bulb Angle.	$6\frac{1}{2} \times 3 \times \frac{8}{20}$ Bulb Angle.	$6 \times 3 \times \frac{8}{20}$
$3 \times 3 \times \frac{6}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	$11 \times \frac{11}{20}$	$5 \times 4 \times \frac{9}{20}$	$7\frac{1}{2} \times 3 \times \frac{10}{20}$ Bulb Angle.	$7 \times 3 \times \frac{9}{20}$ Bulb Angle.	$6 \times 3 \times \frac{8}{20}$ Bulb Angle.
$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$	$3 \times 3 \times \frac{6}{20}$	$11\frac{1}{2} \times \frac{11}{20}$	$5 \times 4 \times \frac{9}{20}$	$8 \times 3 \times \frac{11}{20}$ Bulb Angle.	$7\frac{1}{2} \times 3 \times \frac{10}{20}$ Bulb Angle.	$6\frac{1}{2} \times 3 \times \frac{8}{20}$ Bulb Angle.
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$3 \times 3 \times \frac{7}{20}$	$12 \times \frac{12}{20}$	$5\frac{1}{2} \times 4 \times \frac{9}{20}$			
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$12 \times \frac{12}{20}$	$6 \times 4 \times \frac{9}{20}$			
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$13 \times \frac{13}{20}$	$6 \times 4 \times \frac{10}{20}$			
$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$13 \times \frac{13}{20}$	$6 \times 4 \times \frac{10}{20}$			

(*a*) The beams at the ends of hatchways from six to ten spaces of frames in length, must be equal in size to those of the main deck ; and in awning decks and long bridges to be of the size of spar deck beams.

(*b*) These beams are to be formed of either a plate with double angle bars on its upper and lower edges, or a bulb plate with double angle bars and a covering plate on its upper edge. The beam plates and angle bars are to be of the sizes given above, and the broad flanges of the angle bars are to be fitted horizontally ; the covering plate is to be of the thickness given for the angle bars.

Strong beams at the spar deck in machinery space may be of the size of main deck beams of the same length, with double angle bars on their upper and lower edges of the size given for the corresponding beam, in "hold beams of extra strength."

Semi-box beams may be adopted in lieu thereof, formed of bulb plate and single angle bars of the sizes given for ordinary beams, secured in the usual way to two consecutive frames, and plated over by plating six-twentieths of an inch in thickness.

(*c*) Beams to every frame, when eight-twentieths of an inch thick or above, may be reduced one-twentieth of an inch in thickness, where less than three-fourths of the length of the amidship beam.

(*d*) Bulb beams of the size required for spar deck beams to be fitted in way of windlass or capstan.

The width of the bulb of bulb plates and tee bulbs to be 3¼ times the thickness of the webs, and in bulb angles 2½ times the thickness of the webs.

STEEL VESSELS. Table of Minimum Dimensions of STRINGER

PLATING NUMBERS OF VESSELS. *(See Section 2.)*	2000 to 3000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Dimensions of Main Stringer Plates, &c. — Under 10 Depths, or Under 8 Breadths in Length.	20 × $\frac{5}{20}$	20 × $\frac{6}{20}$	23 × $\frac{6}{20}$	26 × $\frac{6}{20}$	28 × $\frac{6}{20}$	28 × $\frac{7}{20}$	30 × $\frac{7}{20}$	32 × $\frac{7}{20}$	32 × $\frac{8}{20}$	34 × $\frac{8}{20}$	36 × $\frac{8}{20}$
10 to 11 Depths, or 8 to 8½ Breadths.	22 × $\frac{5}{20}$	22 × $\frac{6}{20}$	25 × $\frac{6}{20}$	28 × $\frac{6}{20}$	31 × $\frac{6}{20}$	32 × $\frac{7}{20}$	34 × $\frac{7}{20}$	36 × $\frac{7}{20}$	36 × $\frac{8}{20}$	38 × $\frac{8}{20}$	40 × $\frac{8}{20}$
11 to 12 Depths, or 8½ to 9 Breadths.	24 × $\frac{5}{20}$	25 × $\frac{6}{20}$	28 × $\frac{6}{20}$	31 × $\frac{6}{20}$	34 × $\frac{6}{20}$	36 × $\frac{7}{20}$	38 × $\frac{7}{20}$	40 × $\frac{7}{20}$	40 × $\frac{8}{20}$	42 × $\frac{8}{20}$	44 × $\frac{8}{20}$
12 to 13 Depths, or 9 to 9½ Breadths.	24 × $\frac{6}{20}$	25 × $\frac{7}{20}$	28 × $\frac{7}{20}$	31 × $\frac{7}{20}$	34 × $\frac{7}{20}$	36 × $\frac{8}{20}$	38 × $\frac{8}{20}$	40 × $\frac{8}{20}$	40 × $\frac{9}{20}$	42 × $\frac{9}{20}$	44 × $\frac{9}{20}$
13 to 14 Depths, or 9½ to 10 Breadths.	27 × $\frac{6}{20}$	28 × $\frac{7}{20}$	31 × $\frac{7}{20}$	34 × $\frac{7}{20}$	37 × $\frac{7}{20}$	40 × $\frac{8}{20}$	42 × $\frac{8}{20}$	44 × $\frac{8}{20}$	44 × $\frac{9}{20}$	44 × $\frac{9}{20}$ Steel Deck	46 × $\frac{9}{20}$ $\frac{6}{20}$ for Hl
14 to 15 Depths, or 10 to 10½ Breadths.	30 × $\frac{6}{20}$	31 × $\frac{7}{20}$	31 × $\frac{8}{20}$	34 × $\frac{8}{20}$	37 × $\frac{8}{20}$	40 × $\frac{9}{20}$	42 × $\frac{9}{20}$	44 × $\frac{9}{20}$	44 × $\frac{10}{20}$	46 × $\frac{10}{20}$	48 × $\frac{10}{20}$ Complet
15 to 16 Depths, or over 10½ Breadths.	33 × $\frac{6}{20}$	34 × $\frac{7}{20}$	34 × $\frac{8}{20}$	38 × $\frac{8}{20}$	40 × $\frac{8}{20}$	44 × $\frac{9}{20}$	46 × $\frac{9}{20}$	48 × $\frac{9}{20}$	48 × $\frac{10}{20}$	50 × $\frac{10}{20}$	52 × $\frac{10}{20}$
Ends of Stringer Plates.			15 × $\frac{5}{20}$	17 × $\frac{5}{20}$	19 × $\frac{5}{20}$	19 × $\frac{6}{20}$	20 × $\frac{6}{20}$	22 × $\frac{6}{20}$	22 × $\frac{7}{20}$	23 × $\frac{7}{20}$	24 × $\frac{7}{20}$
Hold and Lower Deck Beam Stringer Plates (extreme breadth).						20 × $\frac{6}{20}$	21 × $\frac{6}{20}$	22 × $\frac{6}{20}$	23 × $\frac{7}{20}$	25 × $\frac{7}{20}$	27 × $\frac{7}{20}$
Ends of Ditto.						16 × $\frac{5}{20}$	16 × $\frac{5}{20}$	17 × $\frac{5}{20}$	18 × $\frac{6}{20}$	19 × $\frac{6}{20}$	21 × $\frac{6}{20}$
Tie Plate on Beams, Fore-and-aft, and Diagonals.			7 × $\frac{6}{20}$	7 × $\frac{6}{20}$	7 × $\frac{6}{20}$	8 × $\frac{7}{20}$	8 × $\frac{7}{20}$	9 × $\frac{7}{20}$	9 × $\frac{8}{20}$	10 × $\frac{8}{20}$	10 × $\frac{8}{20}$
Ends of Ditto.			7 × $\frac{5}{20}$	7 × $\frac{5}{20}$	7 × $\frac{5}{20}$	8 × $\frac{6}{20}$	8 × $\frac{6}{20}$	9 × $\frac{6}{20}$	9 × $\frac{7}{20}$	10 × $\frac{7}{20}$	10 × $\frac{7}{20}$

1. *The depths for proportions to be taken from upper side of keel to top of upper deck beams in one, two, and three deck ships, and to top of main deck in spar and awning deck vessels; and, in spar decked vessels, two depths may be taken off the proportions, so that in a spar-decked vessel of thirteen and under fourteen depths in length, the stringers, &c., may be of the sizes given in the above Table for vessels of eleven and under twelve depths in length; and so on.*

2. In *two decked* vessels the stringer plates indicated with regard to the vessel's proportions in the above Table are to be fitted to the upper deck beams.

3. In *three decked* vessels the stringer plates so indicated in the above Table are to be fitted to both upper and middle deck beams.

4. In *spar decked* vessels the stringer plates given in the above Table are to be fitted to the main deck beams; and the stringer plates required for the spar deck beams are to be the breadth of, and may be $\frac{1}{20}$ of an inch less in thickness than the stringer plates given on the upper line of the Table for vessels of the same plating number, and may be reduced at their ends $\frac{1}{20}$ of an inch in thickness, before and abaft the half length amidships, and to the breadth given for the ends of the main deck stringer plate in the Table.

TABLE S 5.

(For Nos. 27000 to 72000 see Continuation.)

13000	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000
36 × 9/20	40 × 9/20	42 × 9/20	42 × 10/20	44 × 10/20	46 × 10/20	48 × 10/20	50 × 10/20	52 × 10/20	54 × 10/20	54 × 10/20 Stl Dk 6/20	56 × 10/20 ½ Len Amid	Complete 58 × 10/20 Stl Dk 6/20
40 × 9/20	44 × 9/20	46 × 9/20	46 × 10/20	48 × 10/20	50 × 10/20	52 × 10/20	52 × 10/20 Stl Dk 6/20	54 × 10/20 for ½ Lgth	56 × 10/20 Amidships	58 × 10/20 Complete	60 × 10/20 Steel	62 × 10/20 Deck 6/20
44 × 9/20	48 × 9/20	50 × 9/20	46 × 10/20 Steel Deck 6/20 for Hlf	48 × 10/20	50 × 10/20 Length	52 × 10/20 Amidships	54 × 10/20 Complete	56 × 10/20 Steel	58 × 10/20 Deck 6/20	60 × 10/20 Complete	62 × 10/20 Steel	64 × 10/20 Deck 7/20
44 × 10/20 Steel Deck	46 × 10/20 6/20 for Hlf	48 × 10/20 Length	50 × 10/20 Amidships	52 × 10/20 Complete	54 × 10/20 Steel	56 × 10/20 Deck 6/20	58 × 10/20	60 × 10/20	62 × 10/20 Complete	64 × 10/20 Steel	66 × 10/20 Deck 7/20	68 × 10/20
46 × 10/20 Len Amids	48 × 10/20 Complete	50 × 10/20 Steel	52 × 10/20 Deck 6/20	54 × 10/20	58 × 10/20	60 × 10/20	62 × 10/20 Complete	64 × 10/20 Steel	66 × 10/20 Deck 7/20	68 × 10/20	70 × 10/20	Cpl Stl Up Dk 7/20 51 × 10/20 & Mdl Dk ½ L. 7/20
50 × 10/20 Steel	52 × 10/20 Deck 6/20	54 × 10/20	56 × 10/20	58 × 10/20 Complete	62 × 10/20 Steel	64 × 10/20 Deck 7/20	66 × 10/20	68 × 10/20	Complete 46 × 10/20 and Middle	Steel Uppr 48 × 10/20 Dk for Half	Deck 7/20 50 × 10/20 Lngth 7/20	Cmpl Steel Upper and 52 × 10/20 Mdl Dk 7/20
54 × 10/20	56 × 10/20	58 × 10/20	60 × 10/20	62 × 10/20	64 × 10/20	Complete 44 × 10/20 and Middle	Steel Uppr 45 × 10/20 Dk for Half	Deck 7/20 46 × 10/20 Lngth 7/20	Complete 47 × 10/20 Middle	Steel 48 × 10/20 Deck 7/20	Upper and 50 × 10/20 thick	Cpl Stl Up Dk 8/20 52 × 10/20 and Mdl Dk 7/20
24 × 8/20	26 × 8/20	28 × 8/20	28 × 8/20	29 × 8/20	30 × 8/20	31 × 8/20	32 × 8/20	33 × 8/20	35 × 8/20	36 × 8/20	36 × 8/20	37 × 8/20
28 × 8/20	29 × 8/20	30 × 8/20	31 × 9/20	32 × 9/20	33 × 9/20	34 × 9/20	35 × 9/20	37 × 9/20	38 × 9/20	39 × 9/20	40 × 9/20	41 × 9/20
22 × 7/20	23 × 7/20	24 × 7/20	24 × 8/20	25 × 8/20	26 × 8/20	26 × 8/20	27 × 8/20	28 × 8/20	29 × 8/20	30 × 8/20	31 × 8/20	32 × 8/20
10 × 9/20	11 × 9/20	12 × 9/20	12 × 10/20	13 × 10/20	13 × 10/20	13 × 10/20	14 × 10/20	14 × 10/20	15 × 10/20	15 × 10/20	15 × 10/20	16 × 10/20
10 × 8/20	11 × 8/20	12 × 8/20	12 × 8/20	13 × 8/20	13 × 8/20	13 × 8/20	14 × 8/20	14 × 8/20	15 × 8/20	15 × 8/20	15 × 8/20	16 × 8/20

5. In *awning decked* vessels the stringer plates given in the above Table are to be fitted to the main deck beams, and the stringer plates required for the awning deck beams are to be of the same width as those given in the Table for hold beam stringer plates, and to be of the following thicknesses, viz. :—

In Vessels whose plating number is under 13,000, not less than 6/20 of an inch.

13,000	and under	18,000	„	„	7/20	„ „
18,000	„	24,000	„	„	8/20	„ „
24,000	„	31,000	„	„	9/20	„ „

6. *All stringer plates* are to maintain their midship breadth for one-half the vessel's length amidships; from thence the breadth may be gradually reduced to that given above for the ends of the vessel.

STEEL VESSELS.

Table of Minimum Dimensions of STRINGE

PLATING NUMBERS OF VESSELS. *(See Section 2.)*	27000	28000	29000	31000	32000	34000	35000	36000	38000	3900
Under 10 depths, or Under 8 Breadths in Length,	$60 \times \frac{10}{20}$ Complete	$62 \times \frac{10}{20}$ Stl Dk $\frac{6}{20}$	$65 \times \frac{10}{20}$	$68 \times \frac{10}{20}$ Complete	$70 \times \frac{10}{20}$ Steel Deck	$72 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $56 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{7}{20}$ $57 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $58 \times \frac{10}{20}$ Middle	Upp $59 \times$ Dec
10 to 11 Depths, or 8 to 8½ Breadths,	$64 \times \frac{10}{20}$	$66 \times \frac{10}{20}$ Complete	$68 \times \frac{10}{20}$ Steel	$70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	$72 \times \frac{10}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ & Mid Dk	Up Dk $\frac{7}{20}$ $56 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ Middle	Upper and $58 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl S $59 \times$
11 to 12 Depths, or 8½ to 9 Breadths.	$66 \times \frac{10}{20}$ Complete	$68 \times \frac{10}{20}$ Steel	$70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{7}{20}$ $55 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $56 \times \frac{10}{20}$ Middle	Upper $57 \times \frac{10}{20}$ Deck	and $58 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $59 \times \frac{10}{20}$ and	Upp $60 \times$ Midd
12 to 13 Depths, or 9 to 9½ Breadths.	Cmpl Steel $70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $53 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{7}{20}$ $54 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ Middle	Upper and $56 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ and	Upper $58 \times \frac{10}{20}$ Middle Dk	Deck $\frac{8}{20}$ $59 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $60 \times \frac{10}{20}$ Middle	Upp $61 \times$ Dec
13 to 14 Depths, or 9½ to 10 Breadths.	Cmp Stl Up Dk $\frac{7}{20}$ $52 \times \frac{10}{20}$ & Mdl Dk $\frac{7}{20}$ $\frac{1}{2}$ L.	Cmpl Steel $53 \times \frac{10}{20}$ Middle	Upper and $54 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ and Middle	Up Dk $\frac{8}{20}$ $56 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ Middle	Upper $58 \times \frac{10}{20}$ Deck	and $59 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $60 \times \frac{10}{20}$ and	Upp $61 \times$ Middl
14 to 15 Depths, or 10 to 10½ Breadths.	Cmpl Steel Upper and $53 \times \frac{10}{20}$ Mdl Dk $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{8}{20}$ $55 \times \frac{10}{20}$ $\frac{7}{20}$ thick	Cmpl Steel $56 \times \frac{10}{20}$ Middle	Upper and $57 \times \frac{10}{20}$ Deck $\frac{8}{20}$	Cmpl Steel $58 \times \frac{10}{20}$ and	Upper $59 \times \frac{10}{20}$ Middle Dk	Deck $\frac{9}{20}$ $60 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $61 \times \frac{10}{20}$ Middle	Upp $61 \times$ Deck
15 to 16 Depths, or over 10½ Breadths.	Cmp Stl Up Dk $\frac{8}{20}$ $53 \times \frac{10}{20}$ and Mdl Dk $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ Middle Dk	Upper and $55 \times \frac{10}{20}$ $\frac{8}{20}$ thick							
Ends of Stringer Plates.	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$41 \times \frac{8}{20}$	$42 \times \frac{8}{20}$	$43 \times \frac{8}{20}$	$44 \times \frac{8}{20}$	$45 \times \frac{9}{20}$	$45 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$47 \times$
Hold and Lower Deck Beam Stringer Plates (extreme breadth).	$42 \times \frac{9}{20}$	$43 \times \frac{9}{20}$	$44 \times \frac{9}{20}$	$45 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$47 \times \frac{9}{20}$	$48 \times \frac{9}{20}$	$50 \times \frac{9}{20}$	$51 \times \frac{9}{20}$	$52 \times$
Ends of ditto.	$33 \times \frac{8}{20}$	$33 \times \frac{8}{20}$	$34 \times \frac{8}{20}$	$35 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$37 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$41 \times$
Tie Plates on Beams, Fore-and-aft, and Diagonals.	$16 \times \frac{10}{20}$	$17 \times \frac{10}{20}$	$17 \times \frac{10}{20}$	$18 \times \frac{10}{20}$	$18 \times \frac{10}{20}$	$19 \times \frac{10}{20}$	$19 \times \frac{10}{20}$	$20 \times \frac{10}{20}$	$20 \times \frac{10}{20}$	$21 \times$
Ends of ditto.	$16 \times \frac{8}{20}$	$17 \times \frac{8}{20}$	$17 \times \frac{8}{20}$	$18 \times \frac{8}{20}$	$18 \times \frac{8}{20}$	$19 \times \frac{8}{20}$	$19 \times \frac{8}{20}$	$20 \times \frac{8}{20}$	$20 \times \frac{8}{20}$	$21 \times$

Dimensions of Main Stringer Plates, &c.

7. Where a reduction of $\frac{2}{20}$ths of an inch from the midship thickness is allowed for the ends, the stringer plates may be reduced $\frac{1}{20}$th of an inch in thickness for one-eighth of the vessel's length before and abaft the half length amidships, and from thence to the ends they may be reduced to the thickness required at ends.

8. Where there is a *steel deck* prescribed either for the entire length of the vessel, or for half the length amidships, it is to be fitted to the upper deck beams in two-decked vessels. In three-decked vessels and spar-decked vessels it may be fitted either to the upper or middle deck beams.

9. In way of a *steel deck* or *half-steel deck*, the stringer plates may be reduced in width to one inch for every seven feet of the length of the vessel, but the thickness is to be as given above, and at the ends of the vessel the stringer plates to be in accordance with the Table for "ends of stringer plates." Where more than one steel deck is required the stringer plates are to be of the breadth and thickness given in the Table.

10. Where a *steel deck* is prescribed in the Table to be fitted for one half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length, and then tapered gradually into the stringer plates for one eighth the vessel's length at each end.

TABLE S 5.

(Continued.)

40000	42000	44000	46000	48000	50000	52000	54000	57000	60000	64000	68000	72000
and $60 \times \frac{1}{2}\frac{0}{0}$ $\frac{7}{2}\frac{}{0}$ thick	Cmpl Steel $60 \times \frac{1}{2}\frac{1}{0}$ and	Upper Dck $62 \times \frac{1}{2}\frac{1}{0}$ Middle Dk	$\frac{8}{2}\frac{}{0}$ thick $64 \times \frac{1}{2}\frac{1}{0}$ $\frac{7}{2}\frac{}{0}$ thick	Cmpl Steel $66 \times \frac{1}{2}\frac{1}{0}$ Middle	Upper $68 \times \frac{1}{2}\frac{1}{0}$ Deck	and $70 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$	Cmpl Steel $72 \times \frac{1}{2}\frac{1}{0}$ and	Upper $74 \times \frac{1}{2}\frac{1}{0}$ Middle Dk	Deck $\frac{9}{2}\frac{}{0}$ $76 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$	Cmpl Steel $78 \times \frac{1}{2}\frac{1}{0}$ Middle	Upper $80 \times \frac{1}{2}\frac{1}{0}$ Deck	and $82 \times \frac{1}{2}\frac{1}{0}$ $\frac{9}{2}\frac{}{0}$
Upper Dk $\frac{8}{2}\frac{}{0}$ $60 \times \frac{1}{2}\frac{0}{0}$ Deck $\frac{7}{2}\frac{}{0}$ thick	and $60 \times \frac{1}{2}\frac{1}{0}$	Middle $62 \times \frac{1}{2}\frac{1}{0}$	Cmpl Steel $64 \times \frac{1}{2}\frac{1}{0}$ Middle	Upper $66 \times \frac{1}{2}\frac{1}{0}$ Deck	and $68 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$	Cmpl Steel $70 \times \frac{1}{2}\frac{1}{0}$ and	Upper Dk $\frac{9}{2}\frac{}{0}$ $72 \times \frac{1}{2}\frac{1}{0}$ Middle Dk	$74 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$	Cmpl Steel $76 \times \frac{1}{2}\frac{1}{0}$ Middle	Upper $78 \times \frac{1}{2}\frac{1}{0}$ Deck	and $80 \times \frac{1}{2}\frac{1}{0}$ $\frac{9}{2}\frac{}{0}$	3 Dks $\frac{1}{2}\frac{0}{0}$ $82 \times \frac{1}{2}\frac{1}{0}$ $\frac{9}{2}\frac{}{0}$ & $\frac{7}{2}\frac{}{0}$
Deck $\frac{8}{2}\frac{}{0}$ $60 \times \frac{1}{2}\frac{1}{0}$ Deck $\frac{7}{2}\frac{}{0}$	Cmpl Steel $62 \times \frac{1}{2}\frac{1}{0}$ Middle	Upper $64 \times \frac{1}{2}\frac{1}{0}$ Deck $\frac{8}{2}\frac{}{0}$	and $66 \times \frac{1}{2}\frac{1}{0}$ thick	Cmpl Steel $68 \times \frac{1}{2}\frac{1}{0}$ and	Upper Dk $\frac{9}{2}\frac{}{0}$ $70 \times \frac{1}{2}\frac{1}{0}$ Middle Dk $\frac{8}{2}\frac{}{0}$	$72 \times \frac{1}{2}\frac{1}{0}$	$74 \times \frac{1}{2}\frac{1}{0}$	Cmpl Steel $76 \times \frac{1}{2}\frac{1}{0}$ Middle Dk	Upper and $78 \times \frac{1}{2}\frac{1}{0}$ $\frac{9}{2}\frac{}{0}$	$80 \times \frac{1}{2}\frac{1}{0}$	Cmpl Steel $80 \times \frac{1}{2}\frac{1}{0}$ Md Dk $\frac{9}{2}\frac{}{0}$	UpDk $\frac{1}{2}\frac{0}{0}$ $82 \times \frac{1}{2}\frac{1}{0}$ Lr Dk $\frac{7}{2}\frac{}{0}$
and $61 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$ thick	Cmpl Steel $63 \times \frac{1}{2}\frac{1}{0}$ and	Upper $65 \times \frac{1}{2}\frac{1}{0}$ Middle Deck	Deck $\frac{9}{2}\frac{}{0}$ $67 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$ thick	$69 \times \frac{1}{2}\frac{1}{0}$	$71 \times \frac{1}{2}\frac{1}{0}$ Cmpl Steel	$73 \times \frac{1}{2}\frac{1}{0}$ Upper and	$75 \times \frac{1}{2}\frac{1}{0}$ Middle Dk	$77 \times \frac{1}{2}\frac{1}{0}$ $\frac{9}{2}\frac{}{0}$	Cmpl Steel $78 \times \frac{1}{2}\frac{1}{0}$ and	Upper Dk $\frac{1}{2}\frac{0}{0}$ Middle $80 \times \frac{1}{2}\frac{1}{0}$ Lower	$\frac{1}{2}\frac{0}{0}$ Middle Deck $\frac{7}{2}\frac{}{0}$	Deck $\frac{9}{2}\frac{}{0}$ $82 \times \frac{1}{2}\frac{1}{0}$ thick
Deck $\frac{9}{2}\frac{}{0}$ $61 \times \frac{1}{2}\frac{1}{0}$ $\frac{8}{2}\frac{}{0}$ thick	Cmpl Steel $63 \times \frac{1}{2}\frac{1}{0}$ Middle	Upper $65 \times \frac{1}{2}\frac{1}{0}$ Deck $\frac{9}{2}\frac{}{0}$	and $67 \times \frac{1}{2}\frac{1}{0}$ thick	$69 \times \frac{1}{2}\frac{1}{0}$	$71 \times \frac{1}{2}\frac{1}{0}$ and	Upper Dk $\frac{1}{2}\frac{0}{0}$ $73 \times \frac{1}{2}\frac{1}{0}$ Lower	Middle $75 \times \frac{1}{2}\frac{1}{0}$ Deck $\frac{7}{2}\frac{}{0}$	Deck $\frac{9}{2}\frac{}{0}$ $77 \times \frac{1}{2}\frac{1}{0}$ thick	$79 \times \frac{1}{2}\frac{1}{0}$			
and $62 \times \frac{1}{2}\frac{1}{0}$ thick	Cmpl Steel $64 \times \frac{1}{2}\frac{1}{0}$ and Lower	UpDk $\frac{1}{2}\frac{0}{0}$ $66 \times \frac{1}{2}\frac{1}{0}$ Deck	Md Dk $\frac{9}{2}\frac{}{0}$ $68 \times \frac{1}{2}\frac{1}{0}$ $\frac{7}{2}\frac{}{0}$ thick									
$48 \times \frac{9}{2}\frac{}{0}$	$49 \times \frac{9}{2}\frac{}{0}$	$50 \times \frac{9}{2}\frac{}{0}$	$51 \times \frac{9}{2}\frac{}{0}$	$52 \times \frac{9}{2}\frac{}{0}$	$53 \times \frac{9}{2}\frac{}{0}$	$54 \times \frac{9}{2}\frac{}{0}$	$55 \times \frac{9}{2}\frac{}{0}$	$56 \times \frac{9}{2}\frac{}{0}$	$57 \times \frac{9}{2}\frac{}{0}$	$58 \times \frac{9}{2}\frac{}{0}$	$60 \times \frac{9}{2}\frac{}{0}$	$62 \times \frac{9}{2}\frac{}{0}$
$53 \times \frac{1}{2}\frac{0}{0}$	$54 \times \frac{1}{2}\frac{0}{0}$	$55 \times \frac{1}{2}\frac{0}{0}$	$56 \times \frac{1}{2}\frac{0}{0}$	$57 \times \frac{1}{2}\frac{0}{0}$	$58 \times \frac{1}{2}\frac{0}{0}$	$59 \times \frac{1}{2}\frac{0}{0}$	$60 \times \frac{1}{2}\frac{0}{0}$	$61 \times \frac{1}{2}\frac{0}{0}$	$62 \times \frac{1}{2}\frac{0}{0}$	$63 \times \frac{1}{2}\frac{0}{0}$	$64 \times \frac{1}{2}\frac{0}{0}$	$65 \times \frac{1}{2}\frac{0}{0}$
$41 \times \frac{8}{2}\frac{}{0}$	$42 \times \frac{8}{2}\frac{}{0}$	$43 \times \frac{8}{2}\frac{}{0}$	$44 \times \frac{8}{2}\frac{}{0}$	$45 \times \frac{8}{2}\frac{}{0}$	$46 \times \frac{8}{2}\frac{}{0}$	$47 \times \frac{8}{2}\frac{}{0}$	$48 \times \frac{8}{2}\frac{}{0}$	$49 \times \frac{8}{2}\frac{}{0}$	$50 \times \frac{8}{2}\frac{}{0}$	$51 \times \frac{8}{2}\frac{}{0}$	$52 \times \frac{8}{2}\frac{}{0}$	$53 \times \frac{8}{2}\frac{}{0}$
$21 \times \frac{1}{2}\frac{0}{0}$	$22 \times \frac{1}{2}\frac{0}{0}$	$23 \times \frac{1}{2}\frac{0}{0}$	$24 \times \frac{1}{2}\frac{0}{0}$	$25 \times \frac{1}{2}\frac{0}{0}$	$26 \times \frac{1}{2}\frac{0}{0}$	$27 \times \frac{1}{2}\frac{0}{0}$	$28 \times \frac{1}{2}\frac{0}{0}$	$29 \times \frac{1}{2}\frac{0}{0}$	$30 \times \frac{1}{2}\frac{0}{0}$	$31 \times \frac{1}{2}\frac{0}{0}$	$32 \times \frac{1}{2}\frac{0}{0}$	$33 \times \frac{1}{2}\frac{0}{0}$
$21 \times \frac{8}{2}\frac{}{0}$	$22 \times \frac{8}{2}\frac{}{0}$	$23 \times \frac{8}{2}\frac{}{0}$	$24 \times \frac{8}{2}\frac{}{0}$	$25 \times \frac{8}{2}\frac{}{0}$	$26 \times \frac{8}{2}\frac{}{0}$	$27 \times \frac{8}{2}\frac{}{0}$	$28 \times \frac{8}{2}\frac{}{0}$	$29 \times \frac{8}{2}\frac{}{0}$	$30 \times \frac{8}{2}\frac{}{0}$	$31 \times \frac{8}{2}\frac{}{0}$	$32 \times \frac{8}{2}\frac{}{0}$	$33 \times \frac{8}{2}\frac{}{0}$

11. *Orlop stringer plates* where required to be fitted, to be of the same thickness as the hold beam stringer plates, and three-fourths the breadth of the same.

12. Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged, and in addition, where the plating number is 15,000 and above, diagonal tie plates are to be fitted all fore and aft on the upper deck.

13. In sailing vessels whose plating number is under 15,000, and in steam vessels not requiring a steel deck, if *diagonal tie plates* be fitted on the beams in sufficient number, and to the satisfaction of the Surveyor, their breadth as given in the Table may be deducted from the breadth given above for the stringer plates amidships, in which case the stringer plates may be reduced in breadth at the ends of the vessel to three-fourths of their breadth amidships.

14. Tie plates on all tiers of beams to be of the same thickness as the stringer plates of their respective decks.

STEEL VESSELS.

Table of Minimum Dimensions of STRINGE

PLATING NUMBERS OF VESSELS. *(See Section 2.)*	27000	28000	29000	31000	32000	34000	35000	36000	38000	3900
Dimensions of Main Stringer Plates, &c. — Under 10 depths, or Under 8 Breadths in Length,	$60 \times \frac{10}{20}$ Complete	$62 \times \frac{10}{20}$ Stl Dk $\frac{6}{20}$	$65 \times \frac{10}{20}$	$68 \times \frac{10}{20}$ Complete	$70 \times \frac{10}{20}$ Steel Deck	$72 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $56 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{7}{20}$ $57 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $58 \times \frac{10}{20}$ Middle	Upp $59 \times$ Dec
10 to 11 Depths, or 8 to 8½ Breadths,	$64 \times \frac{10}{20}$	$66 \times \frac{10}{20}$ Complete	$68 \times \frac{10}{20}$ Steel	$70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	$72 \times \frac{10}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ & Mid Dk	Up Dk $\frac{7}{20}$ $56 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ Middle	Upper and $58 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl S $59 \times$
11 to 12 Depths, or 8½ to 9 Breadths.	$66 \times \frac{10}{20}$ Complete	$68 \times \frac{10}{20}$ Steel	$70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{7}{20}$ $55 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $56 \times \frac{10}{20}$ Middle	Upper $57 \times \frac{10}{20}$ Deck	and $58 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $59 \times \frac{10}{20}$ and	Upp $60 \times$ Midd
12 to 13 Depths, or 9 to 9½ Breadths.	Cmpl Steel $70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $53 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{7}{20}$ $54 \times \frac{10}{20}$ $\frac{1}{2}$ Lgth $\frac{7}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ Middle	Upper and $56 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ and	Upper $58 \times \frac{10}{20}$ Middle Dk	Deck $\frac{8}{20}$ $59 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $60 \times \frac{10}{20}$ Middle	Upp $61 \times$ Dec
13 to 14 Depths, or 9½ to 10 Breadths.	Cmp Stl $\frac{7}{20}$ Up Dk $\frac{7}{20}$ $52 \times \frac{10}{20}$ & Mdl Dk $\frac{7}{20}$	Cmpl Steel $53 \times \frac{10}{20}$ Middle	Upper and $54 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ and Middle	Up Dk $\frac{8}{20}$ $56 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ Middle	Upper $58 \times \frac{10}{20}$ Deck	and $59 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $60 \times \frac{10}{20}$ and	Upp $61 \times$ Middl
14 to 15 Depths, or 10 to 10½ Breadths.	Cmpl Steel Upper and $53 \times \frac{10}{20}$ Mdl Dk $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{8}{20}$ $55 \times \frac{10}{20}$ $\frac{7}{20}$ thick	Cmpl Steel $56 \times \frac{10}{20}$ Middle	Upper and $57 \times \frac{10}{20}$ Deck $\frac{8}{20}$	Cmpl Steel $58 \times \frac{10}{20}$ and	Upper $59 \times \frac{10}{20}$ Middle Dk	Deck $\frac{9}{20}$ $60 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $61 \times \frac{10}{20}$ Middle	Upp $61 \times$ Deck
15 to 16 Depths, or over 10½ Breadths.	Cmp Stl $\frac{8}{20}$ Up Dk $\frac{8}{20}$ $53 \times \frac{10}{20}$ and Mdl Dk $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ Middle Dk	Upper and $55 \times \frac{10}{20}$ $\frac{8}{20}$ thick							
Ends of Stringer Plates.	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$41 \times \frac{8}{20}$	$42 \times \frac{8}{20}$	$43 \times \frac{8}{20}$	$44 \times \frac{8}{20}$	$45 \times \frac{9}{20}$	$45 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$47 \times$
Hold and Lower Deck Beam Stringer Plates (extreme breadth).	$42 \times \frac{9}{20}$	$43 \times \frac{9}{20}$	$44 \times \frac{9}{20}$	$45 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$47 \times \frac{9}{20}$	$48 \times \frac{9}{20}$	$50 \times \frac{9}{20}$	$51 \times \frac{9}{20}$	$52 \times$
Ends of ditto.	$33 \times \frac{8}{20}$	$33 \times \frac{8}{20}$	$34 \times \frac{8}{20}$	$35 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$37 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$41 \times$
Tie Plates on Beams, Fore-and-aft, and Diagonals.	$16 \times \frac{10}{20}$	$17 \times \frac{10}{20}$	$17 \times \frac{10}{20}$	$18 \times \frac{10}{20}$	$18 \times \frac{10}{20}$	$19 \times \frac{10}{20}$	$19 \times \frac{10}{20}$	$20 \times \frac{10}{20}$	$20 \times \frac{10}{20}$	$21 \times$
Ends of ditto.	$16 \times \frac{8}{20}$	$17 \times \frac{8}{20}$	$17 \times \frac{8}{20}$	$18 \times \frac{8}{20}$	$18 \times \frac{8}{20}$	$19 \times \frac{8}{20}$	$19 \times \frac{8}{20}$	$20 \times \frac{8}{20}$	$20 \times \frac{8}{20}$	$21 \times$

7. Where a reduction of $\frac{2}{20}$ths of an inch from the midship thickness is allowed for the ends, the stringer plates may be reduced $\frac{1}{20}$th of an inch in thickness for one-eighth of the vessel's length before and abaft the half length amidships and from thence to the ends they may be reduced to the thickness required at ends.

8. Where there is a *steel deck* prescribed either for the entire length of the vessel, or for half the length amidships, it is to be fitted to the upper deck beams in two-decked vessels. In three-decked vessels and spar-decked vessels it may be fitted either to the upper or middle deck beams.

9. In way of a *steel deck* or *half-steel deck*, the stringer plates may be reduced in width to one inch for every seven feet of the length of the vessel, but the thickness is to be as given above, and at the ends of the vessel the stringer plates to be in accordance with the Table for "ends of stringer plates." Where more than one steel deck is required the stringer plates are to be of the breadth and thickness given in the Table.

10. Where a *steel deck* is prescribed in the Table to be fitted for one half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length, and then tapered gradually into the stringer plates for one eighth the vessel's length at each end.

TABLE S 5.

(Continued.)

40000	42000	44000	46000	48000	50000	52000	54000	57000	60000	64000	68000	72000
and $60 \times \frac{10}{20}$ $\frac{7}{20}$ thick	Cmpl Steel $60 \times \frac{11}{20}$ and	Upper Dck $62 \times \frac{11}{20}$ Middle Dk	$\frac{8}{20}$ thick $64 \times \frac{11}{20}$ $\frac{7}{20}$ thick	Cmpl Steel $66 \times \frac{11}{20}$ Middle	Upper $68 \times \frac{11}{20}$ Deck	and $70 \times \frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel $72 \times \frac{11}{20}$ and	Upper $74 \times \frac{11}{20}$ Middle Dk	Deck $\frac{9}{20}$ $76 \times \frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel $78 \times \frac{11}{20}$ Middle	Upper $80 \times \frac{11}{20}$ Deck	and $82 \times \frac{11}{20}$ $\frac{9}{20}$
Upper Dk $\frac{8}{20}$ $60 \times \frac{10}{20}$ Deck $\frac{7}{20}$ thick	and $60 \times \frac{11}{20}$	Middle $62 \times \frac{11}{20}$	Cmpl Steel $64 \times \frac{11}{20}$ Middle	Upper $66 \times \frac{11}{20}$ Deck	and $68 \times \frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel $70 \times \frac{11}{20}$ and	Upper Dk $\frac{9}{20}$ $72 \times \frac{11}{20}$ Middle Dk	$74 \times \frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel $76 \times \frac{11}{20}$ Middle	Upper $78 \times \frac{11}{20}$ Deck	and $80 \times \frac{11}{20}$ $\frac{9}{20}$	3 Dks $\frac{10}{20}$ $82 \times \frac{11}{20}$ $\frac{9}{20}$ & $\frac{7}{20}$
Deck $\frac{8}{20}$ $60 \times \frac{11}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $62 \times \frac{11}{20}$ Middle	Upper $64 \times \frac{11}{20}$ Deck $\frac{8}{20}$	and $66 \times \frac{11}{20}$ thick	Cmpl Steel $68 \times \frac{11}{20}$ and	Upper Dk $\frac{9}{20}$ $70 \times \frac{11}{20}$ Middle Dk $\frac{8}{20}$	$72 \times \frac{11}{20}$	$74 \times \frac{11}{20}$	Cmpl Steel $76 \times \frac{11}{20}$ Middle Dk $\frac{9}{20}$	Upper and $78 \times \frac{11}{20}$	$80 \times \frac{11}{20}$	Cmpl Steel $80 \times \frac{11}{20}$ Md Dk $\frac{9}{20}$	UpDk $\frac{10}{20}$ $82 \times \frac{11}{20}$ Lr Dk $\frac{7}{20}$
and $61 \times \frac{11}{20}$ $\frac{8}{20}$ thick	Cmpl Steel $63 \times \frac{11}{20}$ and Middle	Upper $65 \times \frac{11}{20}$ Deck $\frac{8}{20}$	Deck $\frac{9}{20}$ $67 \times \frac{11}{20}$ thick	$69 \times \frac{11}{20}$	$71 \times \frac{11}{20}$ Cmpl Steel	$73 \times \frac{11}{20}$ Upper and	$75 \times \frac{11}{20}$ Middle Dk	$77 \times \frac{11}{20}$ $\frac{9}{20}$	Cmpl Steel $78 \times \frac{11}{20}$ and	Upper Dk $\frac{10}{20}$ Middle $80 \times \frac{11}{20}$ Lower	Deck $\frac{9}{20}$ $82 \times \frac{11}{20}$ Deck $\frac{7}{20}$	$82 \times \frac{11}{20}$ thick
Deck $\frac{9}{20}$ $61 \times \frac{11}{20}$ $\frac{8}{20}$ thick	Cmpl Steel $63 \times \frac{11}{20}$ Middle	Upper $65 \times \frac{11}{20}$ Deck $\frac{9}{20}$	and $67 \times \frac{11}{20}$ thick	$69 \times \frac{11}{20}$	Cmpl Steel $71 \times \frac{11}{20}$ and	Upper Dk $\frac{10}{20}$ $73 \times \frac{11}{20}$ Lower	Middle $75 \times \frac{11}{20}$ Deck $\frac{7}{20}$	Deck $\frac{9}{20}$ $77 \times \frac{11}{20}$ thick	$79 \times \frac{11}{20}$			
and $62 \times \frac{11}{20}$ thick	Cmpl Steel $64 \times \frac{11}{20}$ and Lower	UpDk $\frac{10}{20}$ $66 \times \frac{11}{20}$ Deck	Md Dk $\frac{9}{20}$ $68 \times \frac{11}{20}$ $\frac{7}{20}$ thick									
$48 \times \frac{9}{20}$	$49 \times \frac{9}{20}$	$50 \times \frac{9}{20}$	$51 \times \frac{9}{20}$	$52 \times \frac{9}{20}$	$53 \times \frac{9}{20}$	$54 \times \frac{9}{20}$	$55 \times \frac{9}{20}$	$56 \times \frac{9}{20}$	$57 \times \frac{9}{20}$	$58 \times \frac{9}{20}$	$60 \times \frac{9}{20}$	$62 \times \frac{9}{20}$
$53 \times \frac{10}{20}$	$54 \times \frac{10}{20}$	$55 \times \frac{10}{20}$	$56 \times \frac{10}{20}$	$57 \times \frac{10}{20}$	$58 \times \frac{10}{20}$	$59 \times \frac{10}{20}$	$60 \times \frac{10}{20}$	$61 \times \frac{10}{20}$	$62 \times \frac{10}{20}$	$63 \times \frac{10}{20}$	$64 \times \frac{10}{20}$	$65 \times \frac{10}{20}$
$41 \times \frac{8}{20}$	$42 \times \frac{8}{20}$	$43 \times \frac{8}{20}$	$44 \times \frac{8}{20}$	$45 \times \frac{8}{20}$	$46 \times \frac{8}{20}$	$47 \times \frac{8}{20}$	$48 \times \frac{8}{20}$	$49 \times \frac{8}{20}$	$50 \times \frac{8}{20}$	$51 \times \frac{8}{20}$	$52 \times \frac{8}{20}$	$53 \times \frac{8}{20}$
$21 \times \frac{10}{20}$	$22 \times \frac{10}{20}$	$23 \times \frac{10}{20}$	$24 \times \frac{10}{20}$	$25 \times \frac{10}{20}$	$26 \times \frac{10}{20}$	$27 \times \frac{10}{20}$	$28 \times \frac{10}{20}$	$29 \times \frac{10}{20}$	$30 \times \frac{10}{20}$	$31 \times \frac{10}{20}$	$32 \times \frac{10}{20}$	$33 \times \frac{10}{20}$
$21 \times \frac{8}{20}$	$22 \times \frac{8}{20}$	$23 \times \frac{8}{20}$	$24 \times \frac{8}{20}$	$25 \times \frac{8}{20}$	$26 \times \frac{8}{20}$	$27 \times \frac{8}{20}$	$28 \times \frac{8}{20}$	$29 \times \frac{8}{20}$	$30 \times \frac{8}{20}$	$31 \times \frac{8}{20}$	$32 \times \frac{8}{20}$	$33 \times \frac{8}{20}$

11. *Orlop stringer plates* where required to be fitted, to be of the same thickness as the hold beam stringer plates, and three-fourths the breadth of the same.

12. Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged, and in addition, where the plating number is 15,000 and above, diagonal tie plates are to be fitted all fore and aft on the upper deck.

13. In sailing vessels whose plating number is under 15,000, and in steam vessels not requiring a steel deck, if *diagonal tie plates* be fitted on the beams in sufficient number, and to the satisfaction of the Surveyor, their breadth as given in the Table may be deducted from the breadth given above for the stringer plates amidships, in which case the stringer plates may be reduced in breadth at the ends of the vessel to three-fourths of their breadth amidships.

14. Tie plates on all tiers of beams to be of the same thickness as the stringer plates of their respective decks.

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TABLE 5 6.

(Continued.)

STEEL VESSELS.

Additions beyond the requirements contained in the
to depth than in Vessels for which

Proportion of Depths to Length.	ITEMS.	PLATING UNDER 10450
Above 11 and not exceeding 12	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships 2 3 4 5 6 Add Bulb for $\frac{1}{2}$ length amidships 7 8 One Strake increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships
Above 12 and not exceeding 13	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships 2 3 4 5 6 Add Bulb for $\frac{3}{5}$ length amidships 7 8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships
Above 13 and not exceeding 14	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer Plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add Doubling 18 inches wide for $\frac{3}{5}$ length amidships 2 3 4 5 Double Angle Keelson to be fitted in all cases 6 Add Bulb for $\frac{3}{5}$ length amidships 7 Add Bulb for $\frac{1}{2}$ length amidships 8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships
Above 14 and not exceeding 15	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add Doubling 20 inches wide for $\frac{3}{4}$ length amidships 2 3 4 5 Double Angle Keelson and Bulb all fore and aft 6 Add Bulb for $\frac{3}{5}$ length amidships 7 Add Bulb for $\frac{1}{2}$ length & Intercostal for $\frac{1}{2}$ length amidships, o 8 One Strake doubled for $\frac{1}{2}$ length amidships in lieu of Intercosta
Above 15 and not exceeding 16	1 Sheerstrake 2 Strake below Sheerstrake 3 Second Strake below Sheerstrake 4 Upper deck Stringer plate 5 Middle line Keelson 6 Side Keelson 7 Bilge Keelson 8 Bilge Stringer 9 Bilge Plating	1 2 3 4 5 6 7 8 9

For all Vessels exceeding in length sixteen depths to the Middle Deck, plans must be submitted for the approval of the Committee for giving the Vessels sufficient additional strength longitudinally ; and all Vessels having a length of thirteen depths and above to the Upper Deck, are to have a substantial erection extending over the midship half length of the Vessel. *See also Section* 46.

Where Bulb plates are required they are to be of the size given in Table S 4, for the midship hold beams, or for main deck beams, in vessels with one deck.

Rules ; for Vessels of greater proportionate length the ordinary Scantlings are provided.

TABLE S 6.

(For Nos. 18700 to 40000 see continuation.)

NUMBERS.

10450 and under 15500	15500 and under 18700
1 Add $\frac{1}{20}$ for $\frac{3}{5}$ length amidships	1 Add $\frac{1}{20}$ for $\frac{3}{4}$ length amidships .. ..
2	2 .. ..
3	3 .. ..
4	4 .. ..
5	5 .. ..
6 Add Bulb for $\frac{1}{2}$ length amidships	6 Add Bulb for $\frac{1}{2}$ length amidships .. ..
7	7 .. ..
8 One Strake increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships	8 One Strake increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
3	3 .. ..
4	4 .. ..
5	5 .. ..
6 Add Bulb for $\frac{3}{5}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length amidships .. ..
7	7 .. ..
8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships	8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
1 Add Doubling 20 inches wide for $\frac{3}{5}$ length amidships ..	1 Add Doubling whole width below Stringer for $\frac{3}{5}$ length amids.
2	2 .. ..
3	3 .. ..
4	4 .. ..
5 Add Intercostal	5 .. ..
6 Add Bulb for $\frac{3}{5}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length amidships .. ..
7 Add Bulb for $\frac{1}{2}$ length where no hold beams	7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. .. ..
8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships	8 Three Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
1 Add Doubling whole width below Stringer for $\frac{3}{4}$ length amids.	1 Add Doubling whole width below Stringer for $\frac{3}{4}$ length amids.
2	2 .. ..
3	3 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
4	4 .. ..
5 Add Intercostal	5 .. ..
6 Add Bulb for $\frac{3}{5}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length amidships .. ..
7 Add Intercostal for $\frac{1}{2}$ length amidships, or	7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. .. ..
8 One Strake doubled for $\frac{1}{2}$ length amidships	8 One Strake doubled for $\frac{1}{2}$ length amidships .. .. ..
1 Add Doubling whole width below Stringer for $\frac{3}{4}$ length amids.	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships .. ..
3	3 .. ..
4	4 .. ..
5	5 .. ..
6 Add Intercostal	6 .. ..
7 Add Bulb for $\frac{3}{5}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. .. ..
8 Add Intercostal for $\frac{1}{2}$ length amidships, or	8 Add Intercostal for $\frac{1}{2}$ length amidships, or .. .. ..
9 One Strake doubled for $\frac{1}{2}$ length amidships	9 One Strake doubled for $\frac{1}{2}$ length amidships .. .. ..

All vessels, excepting those with an awning deck, whose plating No. exceeds 35,000 and exceeding 16 depths in length taken from the main deck, are to have the whole of the reverse frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-decked vessels they are all to extend to the main deck.

Additions beyond the requirements contained in the
to depth than in Vessels for which

Proportion of Depths to Length.	ITEMS.	PLATING 18700 and under 26000
Above 11 and not exceeding 12	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships 2 3 4 5 6 Add Bulb for $\frac{3}{5}$ length amidships 7 8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships
Above 12 and not exceeding 13	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships 2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships 3 4 5 6 Add Bulb for $\frac{3}{5}$ length amidships 7 Add Intercostal for $\frac{1}{2}$ length amidships, or 8 Three Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships
Above 13 and not exceeding 14	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add Doubling whole width below Stringer for $\frac{3}{5}$ length amids. 2 3 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships 4 5 6 Add Bulb for $\frac{3}{5}$ length amidships 7 Add Intercostal for $\frac{1}{2}$ length amidships 8
Above 14 an not exceeding 15	1 Sheerstrake 2 Strake below Sheerstrake 3 Upper deck Stringer plate 4 Middle line Keelson 5 Side Keelson 6 Bilge Keelson 7 Bilge Stringer 8 Bilge Plating	1 Add Doubling whole width for $\frac{3}{4}$ length amidships 2 3 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships 4 To be $\frac{1}{4}$ deeper than in Table S 3. 5 Add Bulb for $\frac{1}{2}$ length amidships 6 Add Bulb for $\frac{2}{3}$ length amidships 7 Add Intercostal for $\frac{1}{2}$ length amidships 8
Above 15 and not exceeding 16	1 Sheerstrake 2 Strake below Sheerstrake 3 Second Strake below Sheerstrake 4 Upper deck Stringer Plate 5 Middle line Keelson 6 Side Keelson 7 Bilge Keelson 8 Bilge Stringer 9 Bilge Plating	1 Add Doubling whole width for $\frac{3}{4}$ length amidships 2 Add Doubling whole width for $\frac{1}{2}$ length amidships 3 4 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships 5 To be $\frac{1}{4}$ deeper than in Table S 3. 6 Add Bulb for $\frac{1}{2}$ length amidships 7 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships 8 Add Intercostal for $\frac{3}{5}$ length amidships 9

(*a*) Continuous plate Keelson standing on the floors and attached to Intercostal Keelson plates, having double angles on upper and lower edges of the sizes given in Table S 3, the plate to be of sufficient depth to take the deep flanges of the angles, and to be of the thickness given in Table S 3 for middle line Keelsons.

(*b*) Continuous plate Keelson standing on the floors and attached to Intercostal Keelson plates, having double angles on upper and lower edges of the sizes given in Table S 3, the plate to be three-fourths the depth given in Table S 3 for middle line Keelsons, and of the same thickness.

Rules; for Vessels of greater proportionate length the ordinary Scantlings are provided.

TABLE S 6.
(continued.)

NUMBERS.

26000 and under 35000	35000 and under 40000
1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships .. ..
3	3 .. ..
4	4 .. ..
5 Add Bulb for $\frac{1}{2}$ length amidships	5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships.. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amids. ..
7 Add Intercostal for $\frac{1}{2}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships	2 .. ..
3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships	3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships .. ..
4	4 .. ..
5 Add Bulb for $\frac{1}{2}$ length amidships..	5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships.. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships
7 Add Intercostal for $\frac{1}{2}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add Doubling whole width for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2	2 Add Doubling whole width for $\frac{1}{2}$ length amidships .. ..
3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships	3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships .. ..
4 To be $\frac{1}{4}$ deeper than in Table S 3.	4 To be $\frac{1}{4}$ deeper than in Table S 3. .. ..
5 Add Bulb for $\frac{1}{2}$ length amidships..	5 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships .. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amids. ..	6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amids. ..
7 Add Intercostal for $\frac{3}{5}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add Doubling whole width for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add Doubling whole width for $\frac{1}{2}$ length amidships	2 Add Doubling whole width for $\frac{1}{2}$ length amidships .. ..
3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships	3 Add Doubling 42 inches wide for $\frac{3}{5}$ length amidships.. ..
4 To be $\frac{1}{4}$ deeper than in Table S 3.	4 To be $\frac{1}{4}$ deeper than in Table S 3. .. ..
5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships..	5 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.. .. ..
6 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{3}{5}$ length amids. ..	6 Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships.. .. ..
7 Add Intercostal for $\frac{3}{5}$ length amidships	7 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
8	8 .. ..
1 Add Doubling whole width for $\frac{3}{4}$ length amidships	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. ..
2 Add Doubling whole width for $\frac{3}{5}$ length amidships	2 Add Doubling whole width for $\frac{3}{5}$ length amidships .. ..
3	3 Add Doubling whole width for $\frac{1}{2}$ length amidships .. ..
4 Add Doubling 40 inches wide for $\frac{1}{2}$ length amidships.. ..	4 Add Doubling 50 inches wide for $\frac{3}{5}$ length amidships.. ..
5 To be $\frac{1}{4}$ deeper than in Table S 3.	5 To be $\frac{1}{4}$ deeper than in Table S 3. .. ..
6 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships..	6 Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.. .. ..
7 Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{3}{5}$ length amids. ..	7 Add plate Keelson (*b*) for $\frac{1}{2}$ lngth and Intl for $\frac{3}{5}$ lngth amids
8 Add Intercostal for $\frac{3}{5}$ length amidships	8 Add Intercostal for $\frac{3}{5}$ length amidships .. ..
9	9 .. ..

In lieu of the doubling plates required above, the thickness of the Sheerstrake, the strake next below the sheerstrake, and the upper deck stringer plate may be increased in thickness to afford equivalent strength. In vessels where the plating number is over 28,000, and double butt straps are not required by Section 20, paragraph 8, such straps are to be fitted to the butts of the sheerstrake.

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Table of Scantlings for DOUBLE BOTTOMS CONSTRUCTED ON THE CELLULAR SYSTEM.

PLATING NUMBER FOR REGULATING SCANTLINGS. *(See Section 2.)*	Centre Girder. — Depth above Top of Keel and Thickness.	Thickness of Side Girders	Number of Side Girders (exclusive of Margin Plates) on each side, with Floors at alternate Frames.	Margin Plate. — Depth (exclusive of Flange) and Thickness.	Thickness of Inner Bottom Plating. In Engine and Boiler Space, and Middle Line Strake, for Half Length Amidships (*b*)	Thickness of Inner Bottom Plating. Middle Line Strake at Ends.	Thickness of Inner Bottom Plating. Remainder of Plating before and abaft the Engine and Boiler Space.	Thickness of Brack't or Floor Plates.	DIMENSIONS OF ANGLE BARS. On Centre Girder. (*a*)	DIMENSIONS OF ANGLE BARS. On Margin Plates.	DIMENSIONS OF ANGLE BARS. On Side Girders, Intermediate, and Vertical Angle Bars.
	inches.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Under 11,000	$32 \times \frac{8}{20}$	$\frac{6}{20}$	2	$18 \times \frac{6}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$
11,000 and under 13,000	$33 \times \frac{8}{20}$	$\frac{6}{20}$	2	$19 \times \frac{7}{20}$	$\frac{8}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 2\frac{1}{2} \times \frac{7}{20}$
13,000 and under 15,000	$34 \times \frac{8}{20}$	$\frac{6}{20}$	3	$20 \times \frac{7}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$
15,000 and under 18,000	$35 \times \frac{9}{20}$	$\frac{7}{20}$	3	$21 \times \frac{7}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$4 \times 4 \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3 \times 3 \times \frac{7}{20}$
18,000 and under 21,000	$36 \times \frac{9}{20}$	$\frac{7}{20}$	3	$22 \times \frac{8}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3 \times 3 \times \frac{7}{20}$
21,000 and under 24,000	$38 \times \frac{10}{20}$	$\frac{7}{20}$	3	$24 \times \frac{8}{20}$	$\frac{9}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
24,000 and under 28,000	$40 \times \frac{10}{20}$	$\frac{7}{20}$	3	$26 \times \frac{8}{20}$	$\frac{9}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$\frac{7}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
28,000 and under 33,000	$42 \times \frac{10}{20}$	$\frac{8}{20}$	3	$28 \times \frac{8}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$\frac{8}{20}$ to $\frac{7}{20}$	$\frac{8}{20}$	$4 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$
33,000 and under 38,000	$44 \times \frac{10}{20}$	$\frac{8}{20}$	4	$30 \times \frac{9}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$\frac{8}{20}$ to $\frac{7}{20}$	$\frac{8}{20}$	$4 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$
38,000 and under 44,000	$46 \times \frac{11}{20}$	$\frac{8}{20}$	4	$32 \times \frac{10}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$\frac{8}{20}$	$\frac{9 \text{ to } 8}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
44,000 and under 51,000	$48 \times \frac{11}{20}$	$\frac{9 \text{ to } 8}{20}$	4	$34 \times \frac{10}{20}$	$\frac{11}{20}$	$\frac{9}{20}$	$\frac{9}{20}$ to $\frac{8}{20}$	$\frac{9 \text{ to } 8}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$

(*a*) Where Flat Plate Keels are adopted, the Angles connecting the same to the centre Plate are to be of the size required for Middle Line Keelsons in Table S 3.

(*b*) The breadth of the Middle Line Strake of the Inner Bottom Plating to be not less than that given for Garboard Strakes in Table S 2.

Where Flanged Plates are adopted for Floors, Brackets, Intercostal Plates, &c., as a substitute for fitting angles on the edges, such Plates are to be $\frac{1}{20}$ of an inch thicker than that given in the Table, and the *faying surface* should not be less than the breadth of the flange of the angle required by the rule.

The Floor plates and other parts of the inner bottom in the Boiler space $\frac{1}{20}$th of an inch thicker than given in the above Table.

LLOYD'S REGISTER OF SHIPPING, 2, WHITE LION COURT, CORNHILL, LONDON, E.C.

April 13th, 1893.

STEEL VESSELS.

Showing Diameters and Spacing of Rivets and

	ins.	ins.	ins.	ins.	ins.	ins.	ins.	in
Thickness of PLATES	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{9}{20}$	$\frac{9}{20}$ & $\frac{10}{20}$	$\frac{1}{2}$
Diameter of RIVETS	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$
Breadth of TREBLE riveted STRAPS in inches...	...	...	...	...	$14\frac{1}{4}$	$14\frac{1}{4}$	$14\frac{1}{4}$	16
,, ,, DOUBLE ,, ,, ,, ...	8	8	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	11
,, ,, TREBLE ,, BUTT LAPS ,, ...	...	...	...	...	$7\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{1}{2}$	9
,, ,, DOUBLE ,, ,, ,, ...	$4\frac{1}{4}$	$4\frac{1}{4}$	5	5	5	5	5	6
,, ,, DOUBLE ,, EDGE LAPS ,, ...	$3\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	5
,, ,, SINGLE ,, ,, ,, ...	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	...	...	.
MAXIMUM Spacing of Rivets from centre to centre — In BUTTS of outside plating	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$	3
MAXIMUM Spacing of Rivets from centre to centre — In EDGES (forward and aft)	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	4
MAXIMUM Spacing of Rivets from centre to centre — In FRAMES, REVERSED FRAMES, FLOORS, KEELSONS, and BEAM ANGLES.	$4\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	6

Minimum Number of Rivets in Edges of Platin

	NUMBER OF RIVE							
DIAMETER OF RIVETS.....	ins. $\frac{5}{8}$	ins. $\frac{5}{8}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	ins. $\frac{3}{4}$	i
Spacing of FRAMES.....20 ins.....	7	7	5	5	5	5	...	.
,, ,, ,, ...21 ,, ...	...	7	6	6	6	6	6	
,, ,, ,, ...22 ,, ...	...	...	6	6	6	6	6	
,, ,, ,, ...23 ,, ...	...	...	6	6	6	6	6	
,, ,, ,, ...24 ,, ...	...	...	7	7	7	7	7	
,, ,, ,, ...25 ,, ...	...	...	...	...	...	...	...	
,, ,, ,, ...26 ,, ...	...	...	...	...	...	...	...	

Where the fore and aft flange of the frame does not exceed 3 inches, the rivets attaching the outside plating the should not exceed $\frac{7}{8}$ inch in diameter, and where it is $3\frac{1}{2}$ inches wide, they should not exceed 1 inch in diameter.

RIVETS to be $\frac{1}{4}$ of an inch larger in diameter in the **STEM, STERN FRAME,** and **KEEL,** but in no c need these exceed $1\frac{1}{4}$ inches in diameter, and to be spaced 5 diameters apart.

RIVETS in **RUDDER** to be of not less size than required for the upper edge of garboard strake amidsh spaced not more than 5 diameters apart.

RIVETS connecting flat **KEEL PLATES** and the fore and aft **ANGLES** to be spaced not more tha diameters apart.

Lloyd's Register of Shipping, 2, White Lion Court, Cornhill, London, E.C., 1st October, 1891.

Breadths of Straps, Lapped Butts and Edge Laps.

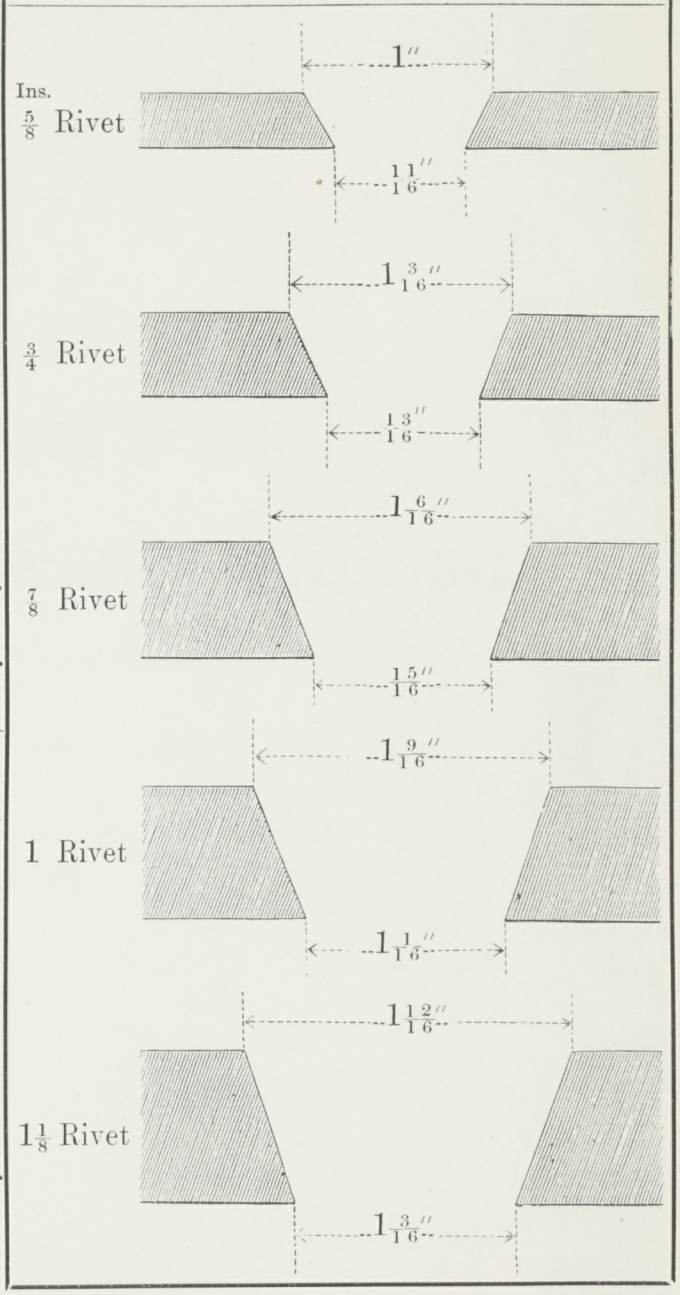
ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
$\frac{11}{20}$	$\frac{12}{20}$	$\frac{12}{20}$ & $\frac{13}{20}$	$\frac{13}{20}$	$\frac{14}{20}$	$\frac{14}{20}$ & $\frac{15}{20}$	$\frac{15}{20}$	$\frac{16}{20}$
$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	1	1
$16\frac{3}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	19	19	19	19
$11\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	...	...	...	...
9	9	9	9	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$
6	6	6	6	...	...	...	...
$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	6	6	6	6
...	...	...	...	...	...	...	...
$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$
4	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$
$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	7	7	7	7

between Frames AMIDSHIPS.

IN EACH ROW.

ins. $\frac{7}{8}$	ins. $\frac{7}{8}$	ins. $\frac{7}{8}$	ins. $\frac{7}{8}$	ins. 1	ins. 1	ins. 1	ins. 1
...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...
5	5	5	5	...	...	...	...
5	5	5	5	5	5	5	5
6	6	6	6	5	5	5	5
6	6	6	6	5	5	5	5
...	...	6	6	5	5	5	5

Size of Countersink for Rivets in Outside Plating.



RIVETS in the **BUTTS** of deck plating to be spaced 4 diameters, and in the edges 4 to $4\frac{1}{2}$ diameters apart.

RIVETS in the **BUTTS** and **EDGES** of inner bottom plating, and in butts of girders, to be spaced not more than 4 diameters apart.

RIVETS in the **LANDS** and **BUTTS** of mast plates to be spaced 5 diameters apart.

LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES FOR WOOD VESSELS.

1894—95.

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RULES

FOR

THE BUILDING AND CLASSIFICATIONS OF WOOD VESSELS.

CHARACTERS.

Section 31. 1. The characters assigned to ships to be, as nearly as possible, a correct indication of their real and intrinsic qualities,* and to be in all cases fixed (not by the Surveyors), but by the Committee, after due consideration of the reports of the Surveyors, and such other documents as may be submitted to them, and will be distinguished as follows :—

SHIPS CLASSED A.

2. To consist of new ships, or ships Continued, or Restored. (*See* Sections 34, and 54 to 59.)

SHIPS CLASSED A, in Red.

3. To consist of ships which have passed the period assigned on the original Survey, or Continuation, or Restoration, and of ships not having had an original character, provided they are found on survey of superior description, fit for the conveyance of dry and perishable goods. (*See* Section 60.)

SHIPS CLASSED Æ.

4. To consist of ships which are found on Survey fit for the safe conveyance of dry and perishable goods, on *short voyages*. (*See* Section 61.)

SHIPS CLASSED E.

5. Will comprise ships which shall be found on Survey fit for the conveyance of cargoes not in their nature subject to sea damage. (*See* Section 64.)

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6. To entitle sailing ships to the Figure 1 for equipment, Sections 72 to 76 must be conformed to and stores supplied in accordance with Table 22, attached to the Rules.

7. For steam vessels see Sections 76 to 78, 81, and 82.

* Ships which are not built in accordance with the principles of the Society's Rules will be marked in the Register Book thus "[*Expl. B.S.*]," denoting that they are built experimentally, and are classed subject to being surveyed biennially.

EXPUNGING OR WITHDRAWAL OF CHARACTER.

8. The fifth, sixth and seventh Columns of the List of Steam Vessels, and the sixth, seventh and eighth columns in the List of Sailing Vessels, left blank, indicate that the Vessel has never been Classed in the Register Book. Three dots (...) in Column 7 of the List of Steamers and Column 8 of the List of Sailing Vessels indicate that the Vessel was at one time Classed by this Society, but that the Class has been withdrawn at Owner's request. A black line with date under it in Column 5 of the List of Steamers and Column 6 of the List of Sailing Vessels indicates that, at that date, the Vessel, from reported defects, was not entitled to a Character in the Register Book. A red line with date under it in these Columns indicates that the Class was withdrawn from non-compliance, at that date with the Society's Rules.

TONNAGE FOR REGULATING THE SCANTLINGS AND EQUIPMENT (AS REGARDS ANCHORS, CHAINS, &c.) OF WOOD VESSELS.

Section 32. 1. In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

2. In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, an awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

3. But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment.

RULES FOR CLASSIFICATION.

SHIPS CLASSED A.

Section 33. 1. Will consist of new ships, and ships which have not passed a prescribed age, and also those which have a Continuation or Restoration of that character, provided they are kept in a state of complete repair and efficiency.

2. The Character A will not be granted to any vessel unless satisfactory evidence of the date, build, and place where built, is produced. (*See* Section 59, *foot-note.*)

Section 34. 1. The number of years to be assigned for Character A is to be determined with reference to the original construction and quality of the vessels, the materials employed, and the mode of building; and their continuance for the time so assigned to depend upon its being shown by occasional surveys (annually, if practicable) that their efficiency is duly maintained. (*See* N.B. at foot.)

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

2. Defects in workmanship or quality of timber will involve a reduction of class, to be determined by the Committee in each case.

HALF-TIME OR INTERMEDIATE SURVEY.*

3. The Characters of ships classed A, or A in Red, will be struck out of the Register Book unless they be submitted to the following intermediate survey, within periods not exceeding four years in the case of vessels classed from six to eight years inclusive, either originally, or on Continuation, or on Restoration, or A in Red, and within periods not exceeding half that assigned in vessels classed for longer terms. Vessels classed for a less period than the above will not be required to undergo such half-time survey.

4. The survey will be noted in the Register Book thus,—"HT" (half-time), with the date of the survey affixed.

SURVEY.

5. The ship to be placed on blocks in dry dock, or on ways, so that the keel and bottom may be seen and properly examined (unless she has been thus surveyed by the Society's officers within the previous twelve months); the hold to be cleared, and proper stages made both inside and outside; the limbers, and all air courses to be cleared; and if the ship has not already got the air courses, described in Section 37 of the Rules, they are now to be made; the outside planking to be scraped bright where the Surveyors may consider it to be necessary from any apparent defect; bolts of lower deck (if of iron) in number not less than six on each side, and treenails in number not less than twelve on each side, to be driven out at various parts of the ship.

6. The attention of the Surveyors is to be then particularly directed to the state of the upper or main deck and coamings, the upper and lower deck bolts, *whether of iron or copper*, and the outside planks through which they pass, and to all other parts of the ship, so far as they can be examined.

7. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

8. The windlass to be unhung and its wood lining sufficiently stripped for examination; the condition of the caulking is also to be ascertained.

9. The cables to be removed from the lockers and ranged, and, with the anchors, masts, spars, and general equipment, examined so as to be satisfactorily reported upon.

10. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout such vessels is to be ascertained and reported upon at the Half-time Survey, and, if necessary, the salt is to be renewed. (*See* Section 37 as regards beams not salted.)

SHIPS BUILT WITH MIXED TIMBER MATERIALS.

11. Ships built with Mixed Timber Materials below the fourteen years' grade, of superior workmanship, and in which *high* class materials and extra fastenings have been judiciously employed to such an extent as to satisfy the Committee, may be allowed a period of original designation exceeding that to which the material of the lowest class used would otherwise entitle them, such additional period not to exceed two years.

* For Composite Ships, *see* Section 43 of the Rule for Composite Ships.

12. Builders seeking this advantage must, in the first instance, submit, for the Committee's approval, a drawing of the midship section, with full details of construction and of the proposed materials and scantlings, through the resident Surveyor, who is to state to the Committee his opinion thereon, and the ship must be built under special survey.

13. No vessel already built, however, can have the advantage of the above rule, except a Special Survey be held on her to determine her claims thereto.

14. The highest (unless of a very limited quantity) and the lowest grade timber materials used in the construction of such Ships will be inserted in the Register Book.

See Sections 57 and 58 as regards application of this Rule to ships surveyed for Restoration.

SURVEYS WHILE BUILDING.
SPECIAL SURVEY.*

Section 35. 1. The Surveyors are to examine, during the progress of a vessel, the materials and workmanship, from the laying of the keel to her completion; and to point out as early as possible anything that may be objectionable.

2. In Steam Vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

NOT UNDER SPECIAL SURVEY.

3. New ships not building under Special Survey are to be surveyed by the Surveyors to this Society, in the following three stages of their progress, or they will be liable to lose one year of the period to which they might otherwise be entitled. (*See* Section 53.)

First. When the Frame is completed, timbers dubbed fair inside and outside ready to receive planking and before any planking is wrought.

Second. When the beams are put in, but before the Decks are laid, and with at least two strakes of the plank of the ceiling between the lower deck and the bilge unwrought, to admit of an examination of the inner surface of the plank of the bottom.

Third. When the Hull is completed, and before the plank is painted or payed.

4. All ships for which a higher character than Ten Years A may be claimed, must be surveyed by an exclusive Officer of the Society, twice at least while building—namely, at the first and at the second stage of their progress as above prescribed. Due notice must be given by the Builder or Owner of their being ready for these surveys.

Section 36. A full statement of the dimensions, scantlings, &c., of all New Ships, verified by the Builder, is to be transmitted by the Surveyor, on a Form similar to No. 1 (*see* at end of Rules), which is to be kept as a record in the office of the Society.

RULES TO BE OBSERVED IN BUILDING SHIPS.

Section 37. 1. The whole of the timber is to be of good quality and properly seasoned, and of the descriptions shown in Table A, as applicable to the several terms of years for which ships may respectively be appointed to remain on the Character A.

* This will entitle the Ship to the distinctive mark ✠.

2. In ships claiming to stand twelve or fourteen years from their timber materials, the stem, stern-post, beams, transoms, apron, knightheads, and keelsons, are to be entirely free from sap and from all defects. The rest of the frame to be well squared and free from sap.

SALTING.

3. One year for salting will be added to the term of classification to which a ship may otherwise be entitled, provided that *during her construction* the openings between the timbers of the frame, at the extremities of the vessel, from the deadwood to the height of the air-courses formed midway between the keelson and the hold beam clamps, and also the buttocks, be filled with salt, and the spaces between the upper air-course and the gunwale be filled before the planksheer is fitted; and that, *within six months of the date of launching*, the salting be completed so as to fill the spaces between the transoms and between the timbers of the frame at each end of the vessel for one-fifth her length, from the deadwood to the gunwale, and amidships from the upper part of the bilges to the gunwale, to the entire satisfaction of the Surveyor. For the purpose of retaining the salt between the timbers, stops are to be introduced immediately above all the air-courses and at the upper part of the bilges.

4. The keelson is also to be cased in and salted all fore and aft, excepting in vessels of 200 tons and under, when it will only be required to be cased in and salted for one-fifth of the vessel's length at each end.

5. In the case, however, of vessels entitled in other respects, from their wood materials, to a class not higher than 10 A, where the keelson is composed of *materials named in lines Nos. 1 and 2* of Table A, it will not be necessary to salt the keelson, except at the ends.

6. The beams on which the weather-deck is to be laid, if salted, are to have a groove gouged on their upper side, except at their extreme ends; the groove to be in width not less than one-fourth the siding of the beam, and one inch in depth, and to be filled with salt as the deck is being laid; but, if not so salted, the beams, *when of wood of the nine years' grade and under*, of all ships to which a year has been or may be granted for "Salting" must, on the occasion of Half-time Survey, be exposed for examination by the removal of deck planking to the extent of one strake all fore and aft at each side of the ship, or to the satisfaction of the Surveyor.* (*See* Section 34.)

7. The state of the salting throughout such vessels is to be ascertained and reported upon at the Half-time and other Special Surveys, and, if necessary, the salt is to be renewed.

Mem.—The foregoing Rule is not to apply to ships built entirely of Teak.

For application of this Rule in repair of ships under the Second Rule for Restoration, see Sections 57 and 58.†

WORKMANSHIP.

8. The workmanship in vessels is to be well executed, and equally so for all grades.

9. Each set of timbers to be frame-bolted together throughout their entire length; the butts of the timbers to be close, and not to be less than one-third of the entire moulding at that place.

* In cases where the beams have not been salted as above prescribed, the notation† will be added to the record in the Register Book—thus, *Salted.*†

† In cases of ships undergoing large repairs (or in other cases), and where ships have not been salted during construction, provided they are opened out to such an extent that the above requirements can be satisfactorily complied with, special application may be made to the Committee, with a view to having the additional year for salting granted.

10. In *all* ships building for classification, where the heads and heels are not full moulded, the timbers are to be well cross-chocked with a proper butt at each end of the chock, each arm to be not less in length than once and a half the moulding of the timbers they connect; in all cases the chocks are to be of a description of wood equal to the best material required by the Rules for the timbers which they unite, excepting the floor-head chocks, which may be of the materials allowed by the Rules for first futtocks.

11. Where the timbers are scarphed, the scarphs to be of proper length and with a butt at each end, and, in cases where the heads and heels of the timbers which come together are full moulded, a dowel (to be of the diameter from one-fourth to one-third of the moulding of the timber) must be introduced into the ends of such timbers in order to connect them; in the case, however, of vessels of 150 tons and under, provided the heads and heels of the frame timbers be otherwise properly secured to each other, dowels may be dispensed with.

AIR-COURSES.

12. In all ships an air-course must be left all fore and aft, either immediately below or one strake below the clamps of each tier of beams; and, in addition, one or two tiers of air-courses must be left in the hold, between the keelson and hold beam clamp, for one-fifth the entire length of the ship at each end.

POOPS AND FORECASTLES.

Section 38. 1. In the construction of top-gallant forecastles, and poops, the timbers must be of the same materials as are required by Table A for the top-timbers of the frames of ships according to the several terms of years appointed for such ships to remain on the character A, all the said timbers to extend to the plankshеer.

2. All the outside planking of top-gallant forecastles, and the sheerstrakes, planksheers, and spirketting of top-gallant forecastles and poops must be of the materials required by Table A for the topsides of the ship; and the shelf and clamps of poops and top-gallant forecastles may be of the same quality as those allowed in Table A for the shelf and clamp of the upper deck.

3. All the beams of top-gallant forecastles, and the mast beams, breast beams and transom beams of poops, to be of the materials required by Table A for the beams of the ship; the remainder of the beams and the waterway of the poops, and the remainder of the planking of poops and top-gallant forecastles may be of cedar, mahogany, Baltic or American red pine, pitch pine, larch, hackmatack, tamarac, or cowdie and rock-elm for such remainder of beams only, and yellow pine or American white spruce in ships below the seven years' grade.

4. In the inside and outside planking, waterways, planksheers, and flat of deck of full poops* and top-gallant forecastles, a reduction of *one-fourth* from the thickness required by the Table B for such planks in the range of the upper deck in ships with two decks, will be allowed; and, in the siding and moulding of the top-timbers and beams of full poops and top-gallant forecastles, a reduction of *one-fifth* will be allowed.

5. The united lengths of poop and forecastle are not to exceed three-fifths of the entire length of the upper deck.

* Parties desirous of making any alteration in the construction of Poops, with a view to diminishing the weight (but preserving the requisite strength), may submit their plans for the Committee's consideration and approval.

RAISED QUARTER-DECKS.

6. The materials required for the construction of raised quarter-decks to be of the same quality as those named in Table A for the main body of the ship.

7. In the inside and outside planking, waterways, planksheers, and flat of deck of raised quarter-decks, a reduction of *one-fifth* from the thickness required by the Table B for such parts in the range of the upper deck in ships with two decks, will be allowed.

SPAR DECKS.

8. In vessels having three decks or tiers of beams, where the space under the upper deck is to be used only for the accommodation of crew and passengers, or to enclose the engine openings of steam vessels, the scantlings are to be regulated as per Section 32.

9. The total depth of hold in spar-decked ships must not exceed thirteen-sixteenths, nor be less than twelve-sixteenths of the ship's extreme breadth.

10. In the construction of spar decks, the timbers must be of the same materials as are required by Table A for the top-timbers of the frames of ships, according to the several terms of years appointed for such ships to remain on the Character A.

11. If *all* the said timbers extend to the plankshеer, their siding and moulding may be reduced one fourth at their heads; but, if only the *alternate* timbers run up to the top height, then a reduction of one-fourth only will be allowed in their moulding at their heads, and in that case there must be a perfect covering board worked all round the ship at the middle deck; and in all cases the middle deck must be a complete deck laid and caulked.

12. All the outside planking, and the sheerstrakes, planksheers, and spirketting must be of the materials required by Table A for the topsides of the ship; and the shelf and clamp may be of the same quality as those allowed in Table A for the shelf and clamp of the middle deck.

13. All the beams before the foremast, and the mast beams, hatch beams, and transom beam, must be of the materials required by Table A for the beams of the ship; and the remainder of the beams and the waterways of spar deck, and the remainder of the planking, may be of red cedar, mahogany, Baltic or American red pine, pitch pine, larch, hackmatack, tamarac, or cowdie; and, in ships below the seven years' grade, the same may be of yellow pine, American white spruce, or white cedar.

14. In spar decks there may be a diminution of *one-fourth* from the dimensions, fastenings, and bolts prescribed in the Tables for the upper deck of ships with two decks (except in the siding of the spar deck beams); but if the outside planking be of either 12 or 14 years' wood, then a reduction of *one-third* may be made in the thickness from that prescribed in Table B for the main sheerstrakes of such vessels.

15. Deckhouses or other erections are allowed on spar decks, but only to the extent of one-tenth of the total superficial area of the spar deck, and are not to exceed seven feet in height. They are not to be placed nearer to either of the ends than one-fifth of the entire length of the vessel.

16. Vessels to which this rule applies, as regards an entire spar deck, will be noted in the Register Book thus—"*Spar decked.*"

THREE-DECKED SHIPS.

17. All dimensions, fastenings, and bolts of the middle deck in vessels having three decks (viz., upper, middle, and lower deck), to be the same as those prescribed in the Tables for the upper deck of ships.

having only two decks; and a reduction of one-sixth from the dimensions, fastenings, and bolts prescribed in the Tables for the upper deck of vessels having only two (viz., upper and lower deck) will be allowed in the third or upper deck. The middle deck to be a complete deck, laid and caulked.

SCANTLINGS.

Section 39. 1. The Scantlings of the timbers, keelson and keel, thickness of planking, &c., are not to be less than those shown in Table B. (*See* Section 32.)

2. The intermediate dimensions for the scantling of timbers between the floor-heads and the gunwale to be regulated in proportion to the distance from the two points.

3. Should the timber and space be increased, the siding of the timbers to be increased in proportion.

4. Whenever ships are built with double floors, thick strakes (*see* Table B) must be worked inside, to extend from the lower part of the short floor-head chocks to the upper part of the long floor-head chocks, and be well bolted through and clenched, with one bolt at the head of each long and short arm of floors, and at the heel of each first and second futtock which comes upon them, from the foremast extending a distance aft equal to three-fifths of the length of the ship; in such cases, the limber strakes need not be through bolted.

FIR SHIPS OF 600 TONS AND ABOVE, AND ALL VESSELS EXCEEDING FIVE BREADTHS, OR EIGHT AND UNDER NINE DEPTHS IN LENGTH.

5. Ships built in the British North American Colonies, and all ships, the frames of which are composed of Fir, of 600 tons and upwards, and all ships (wherever built) the length of which (measured from the fore part of the stem to the after part of the stern-post on the range of upper deck) shall exceed *five* times their extreme breadth, or *eight* times and under *nine* times their depth, shall have diagonal iron plates closely inserted *outside* the frame.* The said plates to extend from the upper side of upper tier of beams to the lower part of chocks at first futtock heads amidships, and to the same perpendicular height forward and aft, measured from the lower part of the keel.

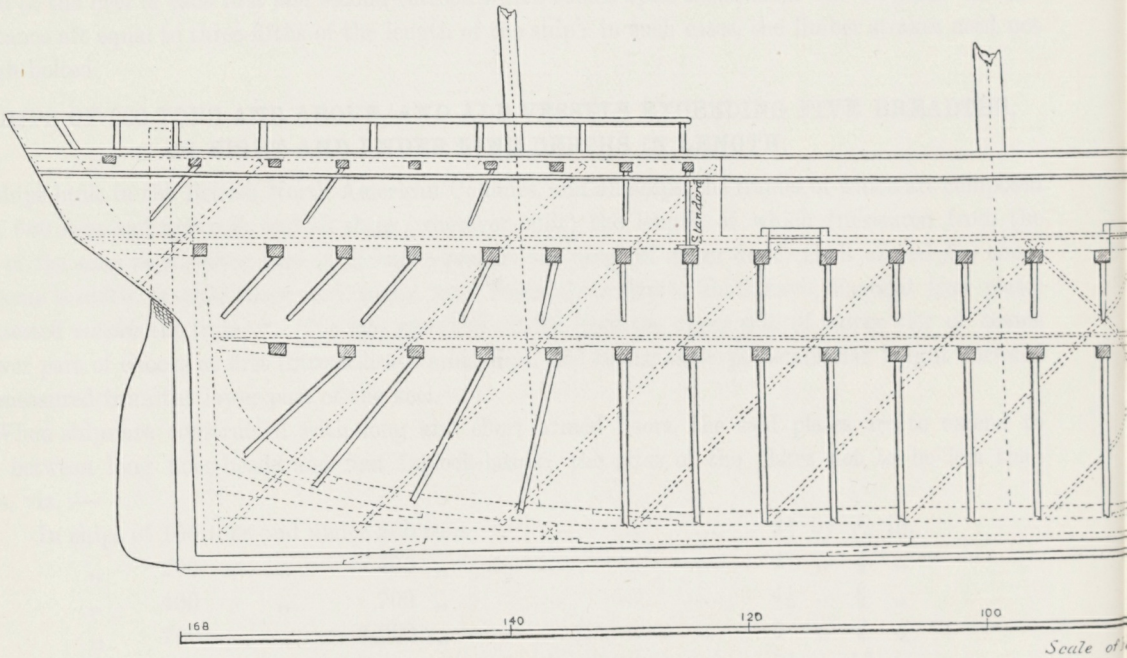
6. When ships are constructed with long and short armed floors, the said plates are to extend to half-way between long floor-heads and first futtock-heads; the sizes of the plates not to be less than as follows, viz.:—

In ships of	100	tons and under	200	tons	...	...	...	$3\frac{1}{2}$	by	$\frac{7}{16}$	in.
„	200	„	400	„	...	...	...	4	„	$\frac{1}{2}$	„
„	400	„	700	„	...	...	...	$4\frac{1}{2}$	„	$\frac{5}{8}$	„
„	700	„	1,000	„	...	...	...	5	„	$\frac{3}{4}$	„
„	1,000	„	1,500	„	...	...	...	$5\frac{1}{2}$	„	$\frac{13}{16}$	„
„	1,500	„	2,000	„	...	...	...	6	„	$\frac{7}{8}$	„
„	2,000	„	and above	...	...	...	...	$6\frac{1}{2}$	„	$\frac{7}{8}$	„

7. The plates to be fastened with bolts, one at each alternate timber, not less in diameter than the sizes given for "through butt bolts" in Table D; and to be well protected by proper coating, likewise the timbers to be coated in the scores which are to receive the said plates.

* Parties objecting to fit the iron plates on frames as prescribed above, are at liberty to submit, through the resident Surveyor, for the Committee's consideration and approval, such compensation as will, in their opinion, render the introduction of the iron plates unnecessary.

A plan shewing the direction of the Iron Pla
prescribed in the Ru



Scale of

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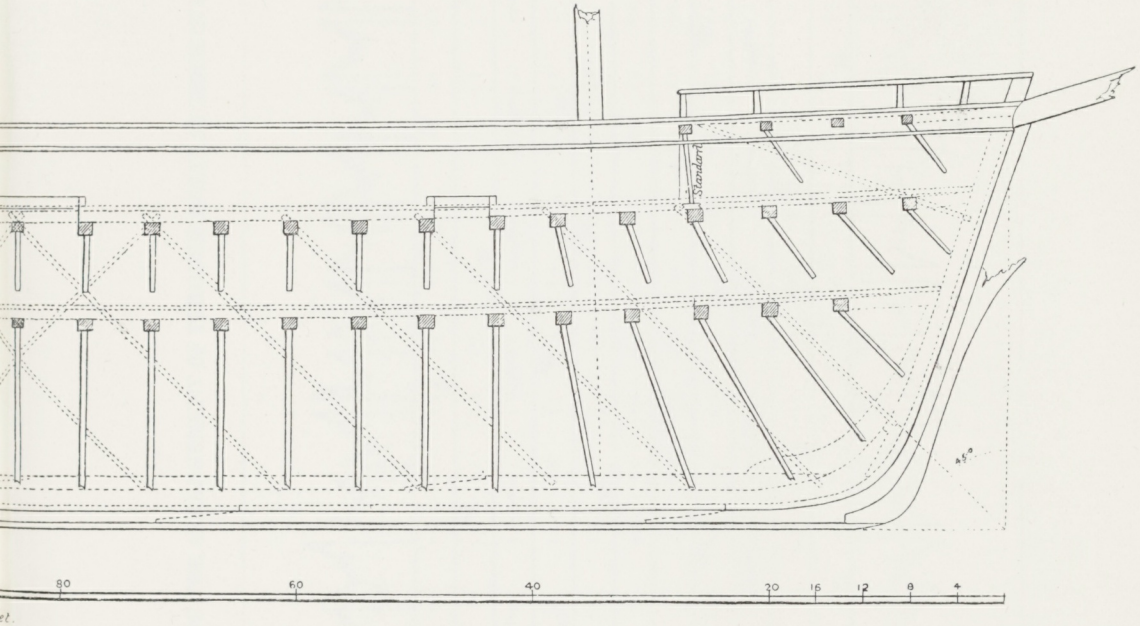

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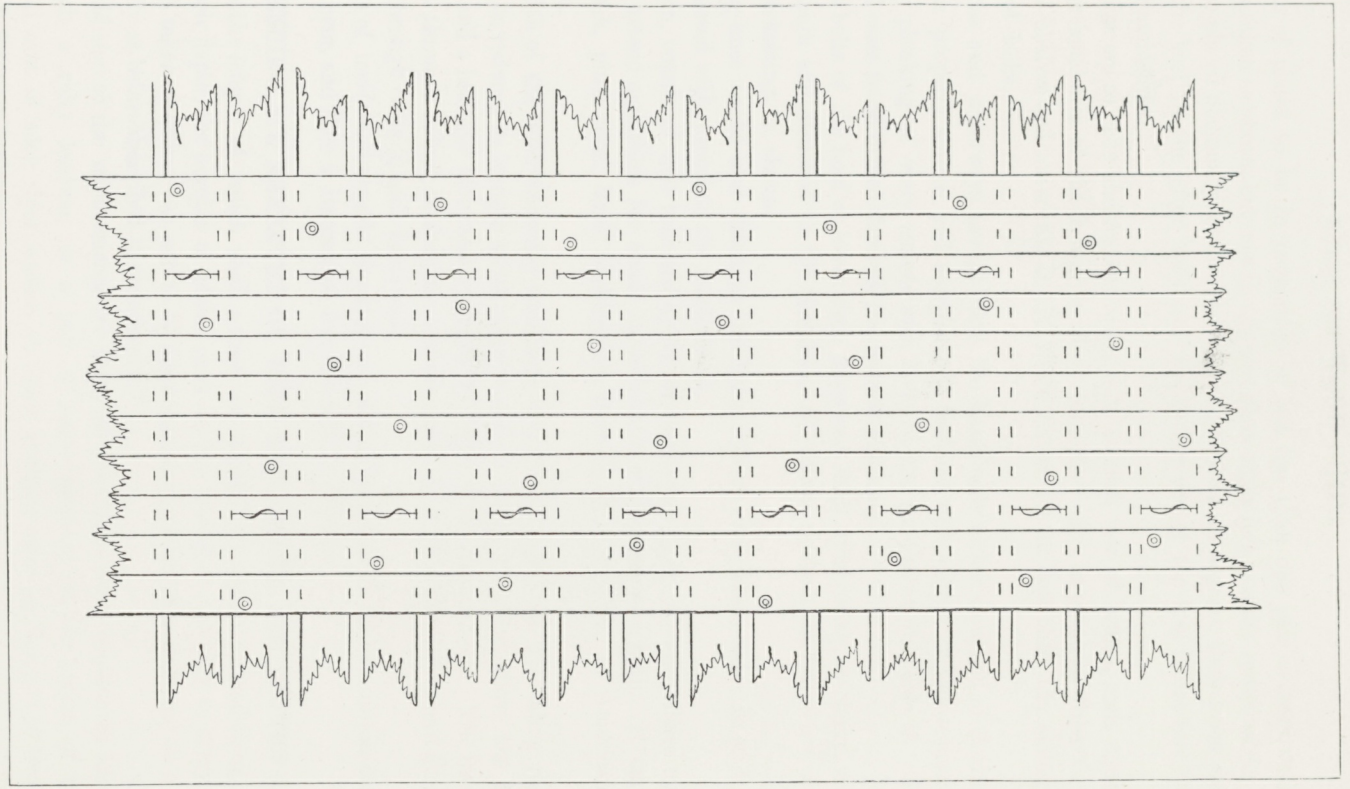
SKETCH SHOWING THE ARRANGEMENT OF THROUGH BOLTS IN THICK STRAKES OVER DOUBLE FLOORS_SECTION 39.



8. The number of plates to be in proportion of not less than one pair to every twelve feet of the ship's entire length taken as above, but not to be more than eight feet asunder measured on a square ; the said plates are to be placed diagonally, at an angle of not less than 45 degrees, their lower ends pointing to the after end of the keel in the after body, and to the fore end of the keel in the fore body, four pairs crossing each other amidships.

9. All such ships are to have shelves and waterways to each tier of beams, each equal in contents to the transverse sectional area of the beams at their respective ends, as given in Table C. The breadth or faying surface of shelves and waterways to the beams must not be less than the siding given for the beams of the several decks.

10. The shelves and waterways are to have the beam ends either dowelled or dovetailed to them, and they are to be properly shifted and scarphed; if fastened with copper or yellow metal, to be bolted through the outside planking at every timber with bolts of the sizes given in Table D. The upper deck binding bolts in all cases to be driven through the outside planking.

11. When the bolts of the hold or lower deck waterway, shelf, spirketting, or clamp, are of *iron*, they may be driven through and clenched on the timbers of the frame, or from the frame and clenched on the waterway, shelf, spirketting, or clamp.

12. A hanging-knee to be also fitted to the lower side of every beam end. In such cases lodging-knees may be dispensed with, except in the mast-rooms.

13. In addition, vessels of 200 tons and above are to have an *inner waterway* fitted on the beams of the upper deck, to extend amidships for about three-fourths of the vessel's length. It may be composed of East Indian teak, pitch pine, larch, hackmatack, Dantzig, Memel, Riga, or American red pine, for vessels of any class.

14. The breadth of the inner waterway amidships is to be not less than the siding required for the beams, but it may be reduced in breadth at its extreme ends, and the thickness above the beams is to be not less than once and a half the thickness required by Table B for flat of deck. The inner waterway is to be in and out through bolted at alternate timbers; and, if its breadth shall exceed six inches, it is to have two vertical through bolts in each beam end.

15. The shifts of inside and outside planking are not to be less than six feet, unless there be a strake wrought between them, and then a distance of five feet will be allowed.

VESSELS EXCEEDING SIX BREADTHS OR NINE AND UNDER TEN DEPTHS IN LENGTH.

16. In vessels the length of which shall exceed *six* times their extreme breadth, or *nine* times and under *ten* times their depth, the number of plates must be not less than one pair to every *ten* feet of the ship's entire length taken as above, but not to be more than six feet asunder measured on a square, and to be placed diagonally as before described in this Section.*

17. And in addition to the requirements for ships of five times their breadth in length such ships must be fitted with a rider keelson, or a pair of sister keelsons, at the option of the Owner, the transverse sectional area of such rider keelson or sister keelsons each to be equal to two-thirds of that required in Table B for main keelsons.

* In cases where the length of the ship exceeds ten times the depth, the Builders or Owners are to submit through the resident Surveyor, for the Committee's approval, their plans for giving the vessel the necessary strength longitudinally.

18. If a rider keelson be adopted, it is to be fastened with a through bolt (of the size required in Table D for keelson bolts), in every frame; or, if the Owner prefers it, every intermediate bolt may be short, passing only through the main and rider keelsons.†

19. If sister keelsons be fitted, they must be fastened with through bolts, in number not less than one in every alternate timber, and of the size required in Table D for "scarphs of keels," &c.

BEAMS.

Section 40. 1. The sizes of the deck and hold beams have been regulated so as to be determined by the length of the beams *amidships*, as shown in Table C. The beams will be required to be of the size of the midship beam, except those at the *after end* of the ship, which may be reduced in proportion to their length.

2. If beams of spruce or yellow pine are used, the siding of such beams shall be one-fourth larger than is prescribed by the above Table, or be increased each way, siding and moulding, equal in area to that amount.

IRON BEAMS.

3. In cases where Iron Beams are fitted in Wood Ships the beams of the upper deck are to be one sixteenth of an inch thicker than is required by the Rules for ships built of Iron, in consequence of the greater space between; and the lower deck or hold beams are to be one-eighth of the depth deeper, and one sixteenth of an inch thicker, than the upper deck beams. The spaces between beams of the several decks not to exceed the spaces at present allowed for wood ships, as per Rule, Section 41. Each tier of beams must have stringer plates riveted on their ends, and tie plates fore and aft, on each side of the hatchways.

4. Parties are to submit, through the resident Surveyor, their plans for attaching Iron beams to the ship's sides, for the Committee's approval.

Section 41. 1. The beams of all decks to be in number and size as hereinafter specified, and to be securely fastened to the sides either with lodging-knees of iron or wood, or with a shelf-piece and waterways, as described in Section 39,‡ or with a shelf-piece and knees, or with some other security equal thereto.

WATERWAYS AND SHELVES.

2. The depth of waterway required for faying surface against timbers, below the underside of the plankshear, is to be as shown in Table B, to receive in and out bolts at alternate timbers, with alternate through bolts in shelf, and in clamp where there is no shelf.

3. Where shelves and waterways are fitted, each should equal in contents the transverse sectional area of the beams at their respective ends, as given in Table C. The breadth or faying surface of shelves and waterways to the beams must not be less than the siding given for the beams of the several decks.

† In all cases in which a rider keelson is fitted, it must be fastened as prescribed above, irrespective of the relative dimensions of the ship.

‡ When the shelves and waterways are fitted and bolted as described in Section 39, having also a hanging-knee to the lower side of every beam end, then lodging-knees may be dispensed with, except in the mast-rooms. In ships of 500 tons and under, where lodging-knees properly bolted are applied, the ordinary plank-clamps may be used, but the bolting of them at alternate timbers, as per Table B, cannot be dispensed with.

4. A hanging-knee to be also fitted to the lower side of every beam end. In such cases lodging-knees may be dispensed with, except in the mast-rooms.

5. The shelves and waterways are to have the beam ends either dowelled or dovetailed to them, and they are to be properly shifted and scarphed; if fastened with copper or yellow metal, to be bolted through the outside planking at every timber with bolts of the sizes given in Table D. The upper deck binding bolts in all cases to be driven through the outside planking.

6. When the bolts of the hold or lower deck waterway, shelf, spirketting, or clamp, are of *iron*, they may be driven through and clenched on the timbers of the frame, or from the frame and clenched on the waterway, shelf, spirketting, or clamp.

7. All vessels of 200 tons and above to have an inner waterway, as stated in Section 39.

8. All ships of 150 tons and above to have vertical knees to the DECK beams; and those of 200 tons and above to have vertical knees to the HOLD beams, in number as shown in Table E.

DEPTH OF HOLD FOR SPACING OF BEAMS.

9. In vessels of 13 feet and under 15 feet depth of hold, the spacing of the hold beams not to exceed 8 feet apart, and the deck beams 4 feet. Vessels of 15 feet and under 18 feet hold, the spacing not to exceed 8 feet and 4 feet apart alternately, or in that proportion; the deck beams to be placed one over every hold beam, and one in all double spaces. In vessels of 18 feet hold and above, the spacing of the beams not to exceed 4 feet 6 inches; the deck beams to be one over every hold beam.

10. The depth in all such cases to be determined by taking the measure from the top of the limber-strake (the thickness of which, for measurement, is to be taken as prescribed in Table B) to the top of the upper deck beams.

11. Ships having a depth of hold, measured from the limber-strake to the under side of the lower deck beam, above 13 feet but not exceeding 15 feet, must be secured with iron riders of the sizes, and be fastened, as shown in Table F, and in number not less than one on every fourth floor, on each side, from fore side of foremast to aft side of mizen-mast, to extend from the lower deck beams downwards so as to receive not less than two bolts in a substantial part of the floors; or by orlop beams, sufficient in number and properly secured.

12. All ships having two decks (viz. upper and lower deck), and exceeding 24 feet in depth from the top of the limber-strake to the top of the upper deck beams, or having three decks (viz. upper, middle and lower deck), and exceeding 24 feet in depth from the under side of the MIDDLE DECK, to have orlop beams, the number to be in no case less than one-half the number of lower deck beams in the space between the foremast and the mizen-mast, except in the case of flush deck ships, when a depth of 25 feet will be allowed, provided in either case the lower hold does not exceed 15 feet, measured as above from the limber-strakes to the under side of the lower deck beam. Should a house be constructed on such flush deck ship for lodging crew or for store-room, the same not to extend within 10 feet of the sternpost.

13. The application of this Rule to British North American built ships, and Fir Ships, will not exempt them from the full operation of the Rule, Section 62.

14. Every ship exceeding 150 tons to have at least one crutch for the security of the heels of the

after timber of the frame; one pair of pointers in addition to a knee at each end of the wing transom to connect the stern frame with the after-body of the ship; and a transom over the heels of the stern timbers properly kneed.

15. The heels of the cant timbers forward and aft to be stepped into the deadwood and bolted through.

16. All hatchways and mast holes to be properly framed to receive half beams where necessary, and to have mast partners to each tier of beams, except the orlop beams. The mast holes, skylights, and companions to be properly secured to the satisfaction of the Surveyors.

FRAME.

Section 42. 1. All timbers of the frame, including those of the poop and forecastle, to extend to the extreme height.

2. The shifts of timber in vessels of 200 tons and upwards to be not less than one-seventh of their main breadth; and, in ships under 200 tons, to be not less than one-sixth of their main breadth.

PLANKING.

Section 43. 1. The outside planking to be of good quality, of the description prescribed in Table A, to be clear of sap and free from all defects.

2. The inside planking to be of the description shown in Table A, and free from all foxy or druxy defects, and decayed knots. With regard to the ceiling plank, and the efficiency of its fastening, it will be required that the planking shall be properly shifted and fastened so that there shall be at least either treenails or through bolts, or short bolts, in each plank of the ceiling *in every timber*.

Section 44. 1. No butts to be nearer than 5 feet to each other (*see* Section 39, for vessels exceeding five breadths or eight and under nine depths in length), unless there be a strake wrought between them, and then a distance of 4 feet will be allowed; and no butts to be on the same timber, unless there be three strakes between, as more particularly shown in the diagram annexed *(see Plate)*, but vessels under 200 tons will be exempted from the full operation of this rule; and in ships of larger tonnage a literal compliance with it will be dispensed with in cases wherein it may be satisfactorily proved that the departure from the rule is only partial, being confined to the ends of the ship, or the planking of the topside, and does not injuriously affect the ship's general strength; but such relaxation will not be sanctioned unless an accurate description of the shifting of the plank be transmitted by the Surveyors, to enable the Committee to form a proper judgment on the case.

2. The thickness of the plank, according to the tonnage of the ship, is not in any instance to be less than is prescribed in Table B.

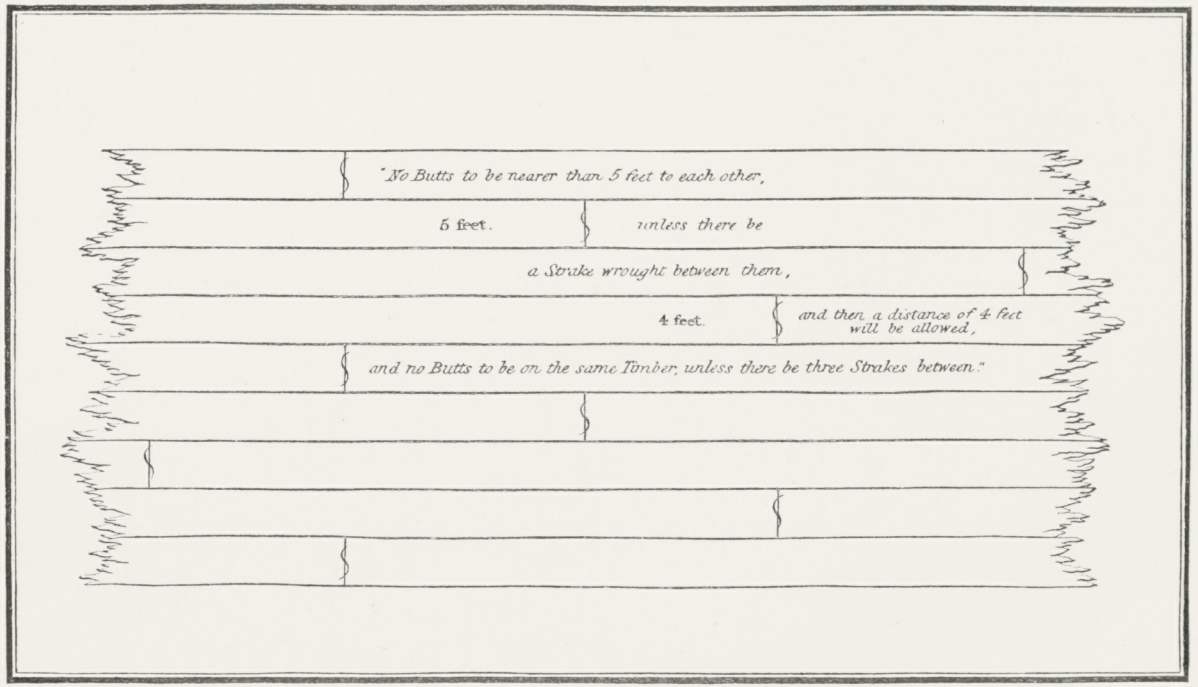
BREADTH OF WALES.

Section 45. 1. The breadth of the wales in every case is to be regulated as under, viz :—

2. When the extreme length of the ship, measured from the fore part of the stem to the after part of the stern-post on the range of upper deck, is six times her depth of hold (or less), the wales are to be in breadth 3in. to every foot of the depth of hold.

3. When the extreme length of the ship is eight times her depth of hold, the wales are to be in breadth 3½in. to every foot of the depth of hold.

SKETCH DESCRIPTIVE OF THE REQUIRED SHIFTING OF PLANK. – *Section 44.* (*See also Section 39*)



The Sketch shews the principle on which the Butts should be arranged, so as to avoid Stepping, *which is deemed bad Workmanship.*

after timber of the frame; one pair of pointers in addition to a knee at each end of the wing transom to connect the stern frame with the after-body of the ship; and a transom over the heels of the stern timbers properly kneed.

15. The heels of the cant timbers forward and aft to be stepped into the deadwood and bolted through.

16. All hatchways and mast holes to be properly framed to receive half beams where necessary, and to have mast partners to each tier of beams, except the orlop beams. The mast holes, skylights, and companions to be properly secured to the satisfaction of the Surveyors.

FRAME.

Section 42. 1. All timbers of the frame, including those of the poop and forecastle, to extend to the extreme height.

2. The shifts of timber in vessels of 200 tons and upwards to be not less than one-seventh of their main breadth; and, in ships under 200 tons, to be not less than one-sixth of their main breadth.

PLANKING.

Section 43. 1. The outside planking to be of good quality, of the description prescribed in Table A, to be clear of sap and free from all defects.

2. The inside planking to be of the description shown in Table A, and free from all foxy or druxy defects, and decayed knots. With regard to the ceiling plank, and the efficiency of its fastening, it will be required that the planking shall be properly shifted and fastened so that there shall be at least either treenails or through bolts, or short bolts, in each plank of the ceiling *in every timber*.

Section 44. 1. No butts to be nearer than 5 feet to each other (*see* Section 39, for vessels exceeding five breadths or eight and under nine depths in length), unless there be a strake wrought between them, and then a distance of 4 feet will be allowed; and no butts to be on the same timber, unless there be three strakes between, as more particularly shown in the diagram annexed *(see Plate)*, but vessels under 200 tons will be exempted from the full operation of this rule; and in ships of larger tonnage a literal compliance with it will be dispensed with in cases wherein it may be satisfactorily proved that the departure from the rule is only partial, being confined to the ends of the ship, or the planking of the topside, and does not injuriously affect the ship's general strength; but such relaxation will not be sanctioned unless an accurate description of the shifting of the plank be transmitted by the Surveyors, to enable the Committee to form a proper judgment on the case.

2. The thickness of the plank, according to the tonnage of the ship, is not in any instance to be less than is prescribed in Table B.

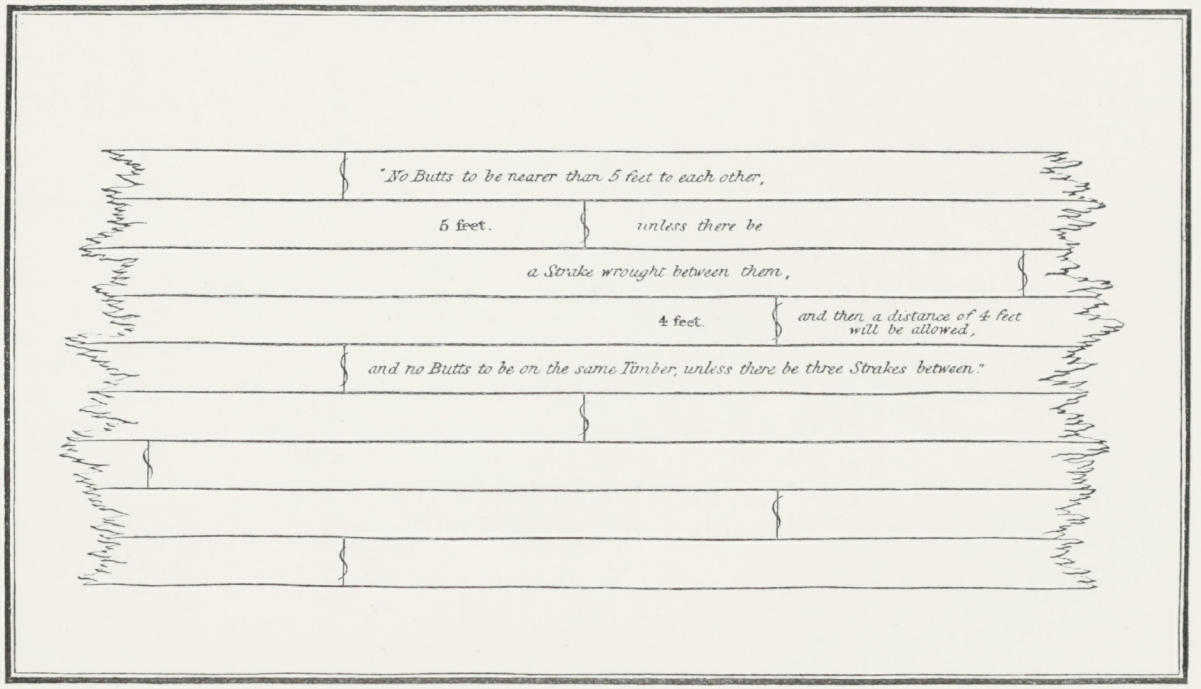
BREADTH OF WALES.

Section 45. 1. The breadth of the wales in every case is to be regulated as under, viz :—

2. When the extreme length of the ship, measured from the fore part of the stem to the after part of the stern-post on the range of upper deck, is six times her depth of hold (or less), the wales are to be in breadth 3in. to every foot of the depth of hold.

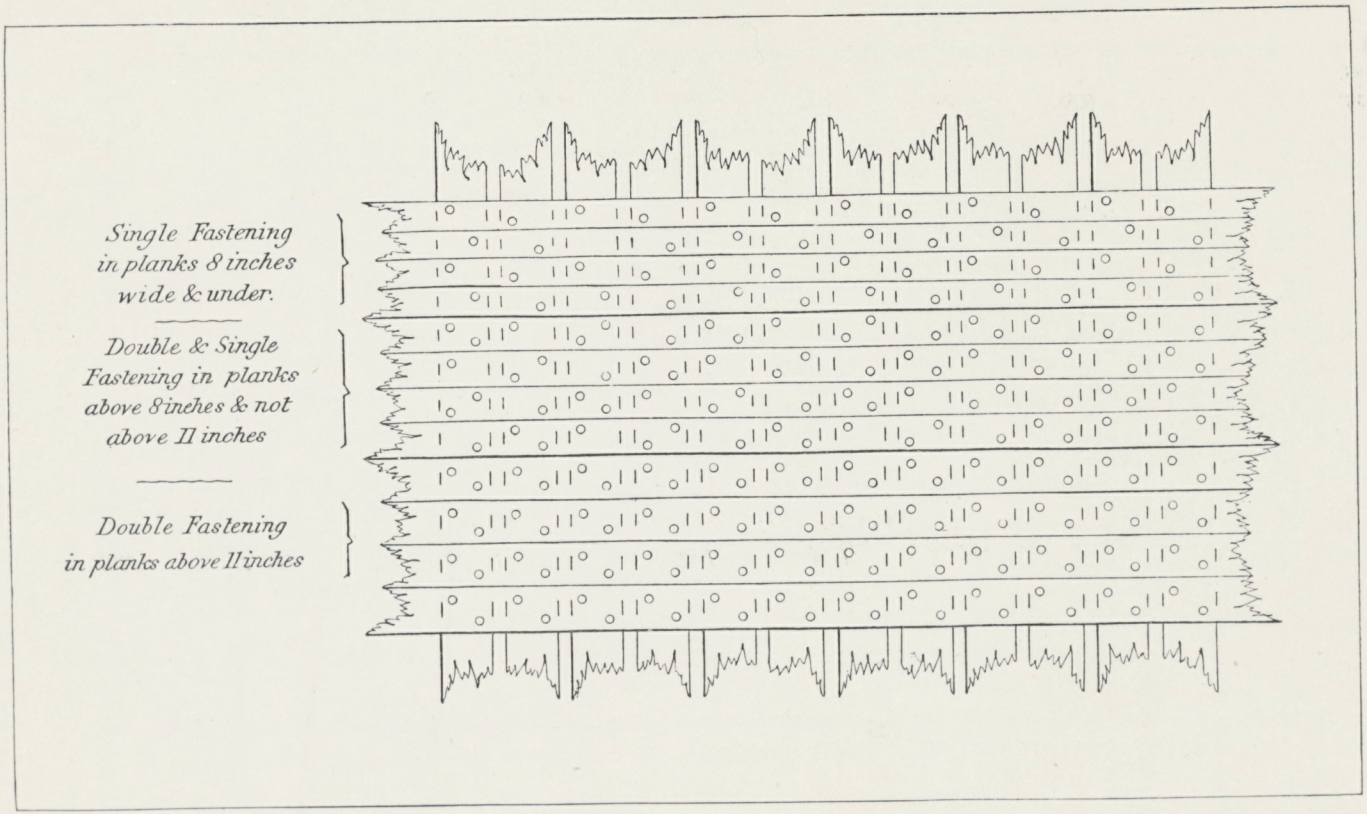
3. When the extreme length of the ship is eight times her depth of hold, the wales are to be in breadth 3½in. to every foot of the depth of hold.

SKETCH DESCRIPTIVE OF THE REQUIRED SHIFTING OF PLANK.—*Section 44.*—*(See also Section 39.)*



The Sketch shews the principle on which the Butts should be arranged, so as to avoid Stepping, *which is deemed bad Workmanship.*

SKETCH SHOWING THE PROPER ARRANGEMENT OF TREENAILS OR BOLTS_SECTION 46.



4. When the extreme length of the ship is ten times her depth of hold (or more), the wales are to be in breadth 4in. to every foot of the depth of hold.

5. And other intermediate dimensions in these proportions.

BILGE PLANKS.

6. The breadth of the bilge planks to be two-thirds that of the wales.

FASTENINGS.

Section 46. 1. Treenails to be of good quality, and of a description equal to the best material through which they pass.* If, however, in ships built in the British North American Colonies, or of Fir, treenails be used of materials not inferior to those comprised in line No. 2 in Table A, including Locust and all Australian and tropical hard woods of durable quality, and Beech in the bottom not higher than floor-heads, a notation of "*Hard Wood Treenails*" will be inserted against the ship's name in the Register Book.

2. The treenails are to be straight and circular, being either engine-turned, compressed, or planed, not graincut or knotty, and must be free from sap and tightly driven, and in all cases the treenails are to be efficiently caulked or wedged outside. In all cases in which planks above eleven inches in width shall be used, they must be double fastened; and those above eight inches in width must be treenailed double and single, except bolts intervene; and, if less than that width, then to be treenailed single.

3. Not less than two-thirds of the treenails are to be driven through the inside planking, clamps, &c.

4. Every butt in each outside plank to be fastened with *two* bolts, one of which may be in the adjoining timber, and one to be through and clenched.†

5. The bilges to be secured with bolts so placed that from the foremast, extending a distance aft equal to three-fifths of the length of the keel, there shall, in ships under 300 tons, be at least one bolt through and clenched in each first futtock; and that in ships of 300 tons and upwards there shall be at least TWO bolts through and clenched for each set of timbers in one or other of the thick bilge strakes; or the bilge planks may be secured as defined in *Paragraph* 13 for EXTRA PERIOD ALLOWED FOR METAL FASTENINGS.

6. All the bolts of the knees, breast-hooks, crutches, riders, transoms, pointers, and keelsons, shelf-pieces, waterways, heels of timbers against fore and after deadwood, and of all other material fastenings, are to be driven through and clenched on rings of the same metal as the bolts. In vessels of 150 tons and under, where the keel is of American Rock Elm, or material of equally hard texture, and where the middle line bolts are of iron, they may be allowed to be driven one and one-half inch short of the underside of the keel, with a wood plug tightly driven against their ends.

7. In knees or knee riders vertically or diagonally fitted, the throat bolts in the side arms are to be placed as near as possible to (but not in) the angle of their throats, and the next bolt should not be at a greater distance than ten inches from the throat bolt, where practicable; also in the bolting of lodging or horizontal knees the same arrangement should be maintained, where the spacing of the timbers will admit of it. "*Jumped knees*" will not be allowed.

* Parties desiring a modification of this requirement must make special application to the Committee in each case.

† Where thick garboard strakes are used, they must be bolted horizontally through the keel and each other.

8. The up and down bolts in the knees to beams are not required to be through the deck, but whether clenched upon the beams, or upon the deck, they must be clenched on rings of the same metal as the bolts.

9. The two bolts, the nearest to the crowns of the pintles and braces of the rudder, are also to be through and clenched, those through the braces to be in the main piece of stern-post.

10. The limber strakes to be bolted at every alternate timber, the bilge planks at every third timber, and the shelves or clamps at every timber *in each strake.**

11. When the heels of the first futtocks meet at the middle line on the keel under the keelson (either with full moulding or with *butted* chocks) the through bolting of the limber strakes may be dispensed with.

12. When the lower deck or hold beam waterways, shelves, spirkettings, clamps and wood lodging knees, the bilge planks, limber strakes, and wood hooks, crutches and pointers, are fastened with iron, the bolts may be either driven through and clenched on the timbers of the frame, or from the timbers of the frame and clenched inside (if iron lodging knees are fitted and fastened with iron, the bolts must be driven from the inside), provided that the in and out bolts of the hanging-knees to the hold or lower deck beams, and those of the knee riders, iron hooks, crutches, or pointers, where such are fitted, are of copper or yellow metal driven through and clenched on the outside plank; and also one bolt in each butt of the bottom planking from the keel to one-fifth the depth of hold below the upper side of the upper deck, and parallel thereto forward and aft, be driven through and clenched on the ceiling, to be of copper or yellow metal, and, in addition, all the short bolts within the same range to be of copper or yellow metal.

EXTRA PERIOD ALLOWED FOR METAL FASTENINGS.

13. An additional year will be allowed to Ships of the A character, either on original Classification or on Restoration under the Second Rule, if fastened externally with treenails, and with copper or yellow metal bolts, to the exclusion of iron, in the outside planking, keel, keelson, deadwood, stem and sternpost, also in the hanging knees and riders, hooks and crutches (the bolts of which must pass through the outside planking), from the lower part of the keel up to the height of one-fifth the midship depth of hold, set down below the upper side of the upper deck at the side, and parallel thereto forward and aft; above which all external bolt fastenings, and the fastenings of the deck, may be of iron, if properly galvanized. The bolts in the heels of timbers abutting against the deadwood, forward and aft, must be of copper or yellow metal driven through and clenched on rings of the same metal; but the limber, bilge, *lower deck or hold beam*, shelf or clamp, and lodging-knee bolts, may be of plain iron, driven through, and clenched on the timbers of the frame, or from the timbers of the frame, and clenched inside. The whole of the remaining fastenings inside may be of plain iron. If iron lodging knees are fitted, their fastenings must be driven from the inside. The limber strakes to be bolted at every alternate timber, the bilge planks at every third timber, and the shelves or clamps at every timber in each strake.

14. In all cases through bolts must be clenched on rings of the same metal.

15. Vessels thus fastened will have the notation of cf. (copper fastened) recorded in the Register Book.

* Watercourses are to be properly formed at underside of all floors and futtocks at the limbers on each side of middle line so as to allow water to reach the pumps freely.

16. Two additional years will be allowed to ships of the A Character, either on original Classification or on Restoration under the Second Rule, if fastened externally with treenails, and with copper or yellow metal bolts or dumps, to the exclusion of iron, from the lower part of keel to the waterway inclusive, and the whole of the inside bolt fastenings, including fastenings of deck, frame bolts, and bolts in iron straps on timbers, and also the chain and preventer bolts, be of properly galvanized iron; but the bolts in heels of timbers abutting against deadwood, forward and aft, must be of copper or yellow metal driven through and clenched on rings of the same metal. The limber, bilge, *lower deck or hold beam*, shelf or clamp, and lodging-knee bolts, may be of properly galvanized iron if driven through and clenched on the timbers of the frame, or from the timbers of the frame and clenched inside. If iron lodging-knees are fitted, their fastenings must be driven from the inside, but the whole of the bolts in the hanging-knees, riders, hooks and crutches, must pass through the outside planking and be of copper or yellow metal. The limber strakes to be bolted at every alternate timber, the bilge planks at every third timber, and the shelves or clamps at every timber in each strake.

17. Vessels thus fastened will have the notation of CF. (Copper Fastened) recorded in the Register Book.

18. Three additional years will be added on original Classification if, in lieu of treenails above the floor-heads, the whole of the planking is fastened with bolts of copper or yellow metal to the waterway inclusive, and the whole of the inside bolt fastenings, including fastenings of deck, frame bolts, and bolts in iron straps on timbers, and also the chain and preventer bolts, be of properly galvanized iron; but the bolts in heels of timbers abutting against deadwood, forward and aft, must be of copper or yellow metal *driven through and clenched on rings of the same metal.* The whole of the bolts in the hanging and lodging-knees, riders, hooks and crutches, must be through and clenched on the outside planking. In such cases of substitution the bolts must be in number the same as is already prescribed above for treenails; the proportion of through bolts must be at least two-thirds, and all the through bolts must be of malleable metal, and clenched on rings of the same metal inside.

19. The sizes of the copper or mixed metal bolts must be as under, viz. :—

In ships of 150 tons	and under	200	tons	...	...	...	$\frac{5}{8}$in.	Smaller sizes must not be used.
200	ditto	350	„	...	...	...	$\frac{3}{4}$in.	
350	ditto	500	„	...	...	...	$1\frac{3}{16}$in.	
500	ditto	700	„	...	...	...	$\frac{7}{8}$in.	
700	ditto	900	„	...	...	...	$1\frac{5}{16}$in.	
900	and above			...	...	...	1in.	

and the lengths of the short bolts not less than as follows, viz. :—

When used in plank of $2\frac{1}{2}$ inches, to be 7 inches long.

3 „ 8 „

4 „ 10 „

5 „ 12 „

and so on in proportion for plank of other thicknesses. The sizes of the bolts required in the several parts must not be less than is shown in Table D.

20. Vessels thus fastened will have the notation of CB (Copper Bolts instead of Treenails) recorded in the Register Book.

21. In British North American or Colonial built ships, and all ships wherever built, the frames of which are composed of Fir, in order to entitle them to the additional term proposed by these sections. Nos. 1, 2, and 3, the rule with reference to "Salting" (Section 37) must in all cases have been complied with originally, or during repair under the Second Rule for Restoration.

Section 47. In every case where the butt bolts are not through and clenched, One Year will be deducted from the period which would otherwise be assigned in the classification of the vessel.

SHIPS BUILT UNDER A ROOF.

Section 48. Ships built under a substantial and efficient roof, kept in good repair, which shall project at each end beyond the length, and on each side beyond the breadth, a quantity equal to half the breadth of the vessel, shall have One Year added to the period prescribed, provided they shall have been surveyed whilst building, and shall have occupied a period of not less than twelve months in their construction, and in which no plank, except as follows, shall have been worked until the expiration of at least three months after the frame was completed, viz. :—not more than three strakes of bilge planks, and two strakes of outside plank in the way of each tier of beams, also the clamps inside, so that the beams may be put in their places.*

Section 49. The scantlings and dimensions for all sized vessels to be proportionately regulated, agreeably to Table B.

SHIPS CLASSED 11 A.

Section 50. Ships surveyed while building, in which *all the materials required for a Twelve Years Ship shall have been used*, and most of the other requisites for that grade fulfilled, but which, from partial deficiencies, may not appear to be in all respects entitled to the full period, although superior to the description of a Ten Years Ship, may be marked in the book thus, 11 A; thereby denoting that they are to remain on that grade *Eleven Years*, provided they be kept in a state of efficient repair.

SHIPS CLASSED 10 A.

Section 51. Ships surveyed while building, in which every *alternate* set of timbers is frame-bolted together throughout their entire lengths, and the scantling and shifts of the timbers, the thickness and shifts of the planks, and size of fastenings may be the same as are required by the Rules, and the description of materials prescribed in Table A shall also have been used, but in which the frame is not so well squared as is required for Twelve Years ships, but which shall be *in other respects* equal thereto shall be marked 10 A; thereby denoting that they are to remain on that grade for *Ten Years*, provided they be kept in a state of efficient repair.

Section 52. 1. In all other cases, ships surveyed while building, and constructed of the materials of good quality, hereinafter shown in Table A, will be allowed the several terms of years respectively appointed, provided they be kept in a state of efficient repair.

* In ships not exceeding 400 tons, a relaxation of the period herein required may be allowed (but not exceeding four months) provided application be made to the Committee, who will appoint a Special Survey, and who will require a report of the date when the timber was felled, its condition after being sided and moulded and stacked for seasoning and also when in frame.

SHIPS NOT BUILT UNDER SURVEY.

2. All Ships not built under Survey, whether in the United Kingdom or abroad, for which a character may be claimed, must be placed in dry dock or laid on blocks in order that their bottoms may be seen and properly examined. They will also be required to have their timbers completely exposed for examination by a plank or listing, as the Surveyor (who must be an exclusive officer of the Society) may direct, being taken out, either inside or outside, all fore and aft, on both sides, equal to one entire strake, at the first futtock-heads, and another between decks. A few treenails must likewise be driven out, so that the Surveyors, from actual inspection, may be satisfied whether or not they are of the quality and make prescribed by the Rules; and the same, being thus ascertained, shall be reported to the Committee, and a character assigned. (*See also* Section 20.)

3. If the ship be 400 tons and upwards, the Survey must be made by two Surveyors, and their report signed accordingly.

Section 53. 1. Ships built in the United Kingdom—or in Quebec; or St. John, New Brunswick, or Miramichi, and Northern Ports of New Brunswick, or in Prince Edward Island, or built in Nova Scotia after 1864—and *not surveyed while building* by the Surveyors to this Society, and all ships, the Owners or Builders of which may have refused or declined to permit them to be surveyed at the several periods prescribed by the Rules, will have One Year deducted from the period which would otherwise have been assigned, in consequence of their not having been submitted to Survey during their construction.

2. In no case, however, will a higher grade than 10 A be assigned *for wood materials* to ships built in the United Kingdom which shall not have been surveyed while building.

CONTINUATION OF SHIPS CLASSED A.

Section 54. 1. If on the termination of the period of original designation, or if, at any subsequent period not exceeding two-thirds of the number of years assigned originally, or on Restoration (provided the last paragraph, Section 56, and 2nd and 3rd paragraphs, Section 57, be complied with), the Owner should wish to have his ship remain, or be replaced on the letter A, he is to send a written notice thereof to the Secretary, and the Committee shall then direct a Special Survey, as follows, to be held by not less than two competent persons to be appointed by the Committee, one of them to be a Surveyor, the exclusive officer of the Society.

2. The period assigned for Continuation will commence from the time of the expiration of the term assigned originally or which might have been assigned on the letter A, without regard to the date when the Survey for this purpose may subsequently have been held. This period may be either one-third or two-thirds the number of years assigned originally, or on Restoration, if the last paragraph, Section 56, or the 2nd and 3rd paragraphs of Section 57, be complied with, dependent on which of the following Surveys, designated Survey No. 1, and Survey No. 2, be complied with. (*See also* Section 52.)

3. Ships so Continued shall be distinguished in the Register Book by the number of years for which the character is extended being inserted separately under the number assigned on the original character thereby denoting that the ship has been found on survey in such good and efficient order as to entitle her to be continued for the specified number of years.

4. But if during the last year of the period assigned originally, or on Restoration (when the Restoration is of such a character as to allow of Continuation—see last paragraph of Section 56 and 2nd and 3rd paragraphs of Section 57), the owner of the ship shall, in consequence of her being about to proceed on a distant foreign voyage, apply to have her specially surveyed for Continuation on the letter A a Special Survey shall be held conformably with this Section.

5. Where such Continuation is assigned, the Half-time Survey as prescribed in Section 34 is to be held, and the vessel to be subject to an annual survey.

6. In cases of the repair of Ships for Continuation of the A Character, materials of a lower grade than those used in the original construction of the ship will be permitted to be used, but they will be noted in the Register Book. Should the materials thus used be not removed on Restoration, the term of Restoration will be reduced, the reduction being regulated by the Mixed Material Rule, Section 34.

7. If, at the termination of the period of Continuation assigned on the original class under Survey No. 2, the owner desires a *further* Continuation of the A Character, the vessel must be submitted to a Special Survey, designated Survey No. 3, when, if found or placed in good and efficient condition, she may be further Continued for a period of one-third the number of years assigned originally; such further Continuation to date from the expiration of the previous Continuation; and if at the end of the term thus assigned the requirements of the Half-time Survey, Section 34, be complied with, and the vessel be favourably reported upon by the Surveyors, she will be allowed to lapse to the character of A in Red (subject to annual Survey) until the expiration of a period of two-thirds the number of years originally assigned, dating from the completion of the Special Survey No. 3.

SURVEY NO. 1.

8. The ship must be either placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

9. To be scraped or dubbed bright, from the light water-mark upwards, including the planksheers and waterways, so as to expose the surface of the plank to view.*

10. The hold to be cleared, and proper stages to be made both inside and outside.

11. All air-courses and the limbers to be cleared.

12. The condition of the timbers of the frame to be further ascertained, by a *new* listing not less than four inches wide being *cut* out of the ceiling at each end of the hold, on each side, between the keelson and air-course under hold beam clamp, for one-fifth the entire length of the ship.

13. One treenail to be driven out from every alternate frame or fourth timber, between the upper

* If the ship has been sheathed with wood over felt, within a period of five years, and the plank from the light water-mark upwards shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained, and favourably reported upon by the Surveyors, the stripping from the light water-mark upwards may, on application to the Committee, be dispensed with, providing that the sheathing which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listings of sheathing be cut out at hood ends; and the planking, fastenings, and caulking so exposed, shall prove to be in good condition; but, whenever the sheathing is removed, the outside planking is to be scraped or dubbed bright, and examined as prescribed by the above Rule.

If the ship has been sheathed with metal within a period of two years, and it shall appear to the Surveyors that stripping from the light water-mark upwards may be dispensed with, the case will receive due consideration on application to the Committee.

edge of the wales and planksheers, and one from every alternate frame or fourth timber, between the upper edge of the wales and the light water-mark, and at such other parts of the bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers and planking in the treenail holes.

14. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

15. If the fastenings in the range of the lower deck be *of iron not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained ; if they are not in a satisfactory condition, the vessel must be through bolted in these parts, as the Surveyors may direct.

16. All treenails, bolts, and listings, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

17. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel, in each alternate frame, also through the stem, apron, stern-post, and deadwood.

18. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

19. The condition of the oakum and caulking to be ascertained.

20. In the case of vessels allowed an additional year in classing for salting, under Section 37, the state of the salting throughout such vessels is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

21. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

22. The cables, masts, spars, and general equipment to be attended to, as prescribed in Sections 72 to 76.

23. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and coamings, the upper and lower deck bolts, whether of iron or copper, and the outside planks, through which they pass, the planksheers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, stern-post, inner-post, and transoms; the floors, keelsons, and keel; the rudder and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

24. The ship to be efficiently repaired with suitable materials.

25. The Surveyors on these points shall transmit to the Committee a detailed report, accompanied by such observations as may occur to them, from inspection of the ship, or from information of the repairs she may have received. If, from the report of such Special Survey, the ship shall appear to be in a sound and efficient state, the Committee shall continue such ship on the letter A, for such further period as they may think fit, not exceeding, however, *one-third* of the number of years which had been assigned originally, or on Restoration. No ship, however, can have a continuation of the A Character *after Restoration* unless the last paragraph, Section 56, or the 2nd and 3rd paragraphs of Section 57, be complied with.

26. Ships classed A for a less period than six years, will be allowed a Continuation of two years provided that in addition to the above requirements the Owner shall have removed a plank in each buttock.

27. Ships built in the British North American Colonies will have to comply with the Rules, Section 63.

28. If, however, at the time of the above Survey, or at any time during the term of Continuation, the ship be *diagonally* doubled according to Section 68; then in the case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding 5 and under 12 years' grade will be allowed 3 years additional, and those built of 12 years' materials and upwards, 4 years additional; provided a strake all fore and aft at the upper edge of the doubling, or the planksheer be removed.

SURVEY NO. 2.

29. For the purpose of holding such Survey, the ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

30. All sheathing (wood or metal) to be entirely stripped off the bottom, and elsewhere.*

31. All the outside planking from the light water-mark upwards, including the planksheers and waterways, to be scraped or dubbed bright.

32. The hold to be cleared, and proper stages made both inside and outside.

33. All air-courses and the limbers to be cleared.

34. The condition of the timbers of the frame to be further ascertained by the removal of all the treenails in *one* strake in the topsides fore and aft on each side, and by the removal of *two* planks on each side above the wales (except in vessels of 200 tons or under, when the removal of *one* plank on each side will be deemed sufficient).

35. In addition, a plank to be removed in each bow and each buttock.

36. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the topsides and bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers and planking in the treenail holes.

37. If the *whole* of the treenails from the light water-mark upwards have to be renewed, the removal of a plank in each bow and buttock will be sufficient, provided the timbers in the treenail hole be examined, and found in good condition.

38. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

* If the ship has been sheathed with wood over felt, within a period of five years, and the plank shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained and favourably reported upon by the Surveyors, the stripping of the wood sheathing may, on application to the Committee, be dispensed with, provided that the sheathing which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listing of sheathing be cut out at hood ends; and the planking, fastenings, and caulking so exposed, shall prove to be in good condition; but, whenever it is removed, the outside planking is to be scraped or dubbed bright, and examined as prescribed by the above Rule.

39. If the fastenings in the range of the lower deck be *of iron, not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts as the Surveyors may direct.

40. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, sternpost, and deadwood.

41. Plank, or *new* listing of ceiling of sufficient breadth (not less than 4 inches wide), at the discretion of the Surveyors, to be cut out of the ceiling in the range of the floor-heads, or at such height as may, in the judgment of the Surveyors, best expose the timbers of the frame to view, at each end of the hold on each side for one-fifth the entire length of the ship, and for the remaining three-fifths of the ship's length, the state of the timbers to be ascertained by driving out a treenail from every fourth timber in one or other of the strakes of bilge planking. If the Shipowner should prefer it, planking may be removed *outside* at each end of the ship in the range of the floor-heads.

42. In order to ascertain the condition of the upper deck beam ends, a strake of deck next the waterways on each side to be taken up except where it is covered by a poop or a forecastle; and where this exception arises the strake should be removed as far aft as the first beam within the poop, and as far forward as the first beam within the forecastle. On the decks below, as well as on the upper deck beyond the above limits, the plank need not be removed, provided the beams be tested by boring and sounding, and be found good.

43. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

44. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

45. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

46. The condition of the oakum and caulking to be ascertained.

47. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

48. The anchors, cables, masts, spars, and general equipment, to be attended to as prescribed in Sections 72 to 76.

49. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and coamings, the upper and lower deck bolts, whether of iron or copper, and the outside planks through which they pass; the plankshеers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, sternpost, inner-post, and transoms; the floors and keelson; the keel, rudder, and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

50. The ship to be efficiently repaired with suitable materials.

51. The Surveyors on these points shall transmit to the Committee a detailed report, accompanied by such observations as may occur to them, from inspection of the ship, or from information of the repairs

she may have received. If, from the report of such Special Survey, the ship shall appear to be in a sound and thoroughly efficient state, the Committee shall continue such ship on the letter A for such further period as they may think fit, not exceeding, however, *two-thirds* of the number of years which had been assigned originally or on Restoration. No ship, however, can have a Continuation of the A Character *after Restoration*, unless the last paragraph, Section 56, or the 2nd and 3rd paragraphs of Section 57, be complied with.

52. If, however, at the time of the above Survey, or at any time during the term of Continuation, the ship be *diagonally* doubled, and the other requirements be complied with, according to Section 68, then, in case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under 12 years' grade will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional.

53. If such extended term be given for the doubling, the materials used in the repairs must be equal in grade to those required in the original construction of the ship, or she will be liable to a reduced class regulated by the Mixed Material Rule, Section 34.

SURVEY NO. 3.

FURTHER CONTINUATION OF SHIPS CLASSED A.

54. For the purpose of holding such Survey, the ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

55. All sheathing (wood or metal) to be entirely stripped off the bottom and elsewhere.*

56. All the outside planking, from the light water-mark upwards, including the plank sheers and waterways, to be scraped or dubbed bright.

57. The hold to be cleared, and proper stages made both inside and outside.

58 All air-courses and the limbers to be cleared.

59. The condition of the timbers of the frame to be further ascertained by the removal of planking equal to one strake fore and aft on each side above the wales; and a short plank in each buttock. In addition, a strake of planking to be removed, or a new listing of sufficient breadth not less than four inches, all fore and aft on each side in the ceiling above the floor heads; or, if the Shipowner should prefer it, a strake of planking may be removed outside at the same height.

60. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the topsides and bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails and the timbers and planking in the treenail holes.

61. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier

* If the ship has been sheathed in wood over felt, within a period of five years, and the plank shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained and favourably reported upon by the Surveyors, the stripping of the wood sheathing may, on application to the Committee, be dispensed with; provided that the sheathing which covers the binding-bolts and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listing of sheathing be cut out at hood ends; and the planking, fastenings and caulking so exposed shall prove to be in good condition; but, whenever it is removed, the outside planking is to be scraped and dubbed bright, and examined as prescribed by the above Rule.

of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

62. If the fastenings in the range of the lower deck be *of iron, not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts, as the Surveyors may direct.

63. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, stern-post, and deadwood.

64. In order to ascertain the condition of the upper deck beam ends, a strake of deck next the waterways on each side to be taken out, except where it is covered by a poop or a forecastle; and, where this exception arises, the strake should be removed as far aft as the first beam within the poop, and as far forward as the first beam within the forecastle. On the decks below, as well as on the upper deck beyond the above limits, the plank need not be removed, provided the beams be tested by boring and sounding, and be found good.

65. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

66. All yellow metal bolts to be tested when practicable, to ascertain if any are broken.

67. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

68. The condition of the oakum and caulking to be ascertained.

69. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

70. The anchors, cables, masts, spars, and general equipment, to be attended to as prescribed in Sections 72 to 76.

71. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and coamings, the upper and lower deck bolts, whether of iron or copper, and the outside planks through which they pass, the planksheers, waterways and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, stern-post, inner-post, and transoms, the floors and keelson, the keel, rudder, and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

72. The ship to be efficiently repaired with suitable materials.

73. The Surveyors on these points shall transmit to the Committee a detailed report, accompanied by such observations as may occur to them, from inspection of the ship, or from information of the repairs she may have received. If, from the report of such Special Survey, the ship shall appear to be in a sound and thoroughly efficient state, the Committee shall continue such ship on the letter A for such further period as she may be eligible, not exceeding, however, *one-third* of the number of years which had been assigned originally, such further Continuation to date from the expiration of the term of Continuation assigned under the Second Survey.

74. If, however, at the time of the above Survey, or at any time during the term of Continuation,

the ship be *diagonally* doubled, and the other requirements be complied with, according to Section 68, then, in case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under 12 years' grade will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional.

75. If such extended term be given for the doubling, the materials used in the repairs must be equal in grade to those required in the original construction of the ship, or she will be liable to a reduced class regulated by the Mixed Material Rule, Section 34.

RESTORATION OF SHIPS TO THE CHARACTER A.

Section 55. 1. If at *any age* of a vessel the Owner be desirous to have his ship Restored to the A character, such Restoration will be granted for a period not exceeding *one-half* of the term originally assigned, the same to be calculated from the date of such repairs; provided that a Special Survey as hereafter described be held by two Surveyors, one of them to be an exclusive Officer of the Society, and that all repairs found necessary be completed to their satisfaction.

2. If, at the expiration of such Restoration, the owner be desirous to have his ship again Restored, she must be subjected to the requirements of the second Rule for Restoration.

REQUISITES FOR RESTORATION.—FIRST RULE.*

Section 56. 1. The ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

2. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.

3. All the outside planking from the light water-mark upwards, including the waterways, poop and forecastle, planksheers, the stem, knight-heads and hawse-timbers, and the stern-post and rudder, where exposed; also the shelves, clamps, hold-beams, waterways, all inside planking, and the keelson to be scraped or dubbed bright.

4. The hold to be cleared, and proper stages made both inside and outside.

5. All air-courses and the limbers to be cleared. The condition of the timbers of the frame to be further ascertained by the removal of one strake of topside planking all fore and aft on each side.

6. In addition, a plank to be removed in each bow and each buttock.

7. In all cases the outside planks through which the chain and preventer bolts pass must be removed.

8. In flush-deck ships all the planksheer and spirketting to be removed, but in ships having a poop or top-gallant forecastle it will only be necessary to remove the planksheer and spirketting between these and the mouldings in continuation of the planksheer forward and aft, or a portion of topside planking extending from the fore part of the poop aft, and from the after part of the top-gallant forecastle forward.

9. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the planksheer, and one from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, also one to be driven out from every fourth timber for half the vessel's length amidships on each side at the bilge, and at such other parts of the vessel as the

* In the case of the Restoration of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

Surveyors may direct, in order that the state of the treenails, and the timbers and planking in the treenail holes, may be ascertained.

10. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

11. If the fastenings in the range of the lower deck be of *iron, not through the outside planking*, one plank on each side is to be removed, so that the condition of these fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts as the Surveyors may direct.

12. *Where the middle-line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel, in each alternate frame also through the stem, apron, sternpost, and deadwood.

13. A strake of ceiling to be removed all fore and aft, in the range of the first futtock-heads, or at such height forward and aft as may, in the judgment of the Surveyors, best expose the timbers of the frame and chocks to view.

14. One plank of ceiling on each side at the floor-heads to be removed.

15. In order to ascertain the condition of the deck beam ends, a strake of deck next the main or inner waterway to be removed from each tier of beams, excepting that, in ships having a poop or a top-gallant forecastle, the upper deck need not be removed abaft the first beam within the poop, or before the first beam within the forecastle; provided the remainder of the upper deck beams under the poop and forecastle be tested by boring and sounding, and be found good.

16. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

17. All yellow metal bolts to be tested, where practicable, to ascertain if any are broken.

18. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

19. The condition of the oakum and caulking to be ascertained.

20. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

21. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.

22. When in the state above described, the ship is to be submitted to a special survey and examination, at which the attention of the Surveyors is to be particularly directed to the state of the upper or main deck and coamings, the upper and lower deck bolts, whether of iron or copper, and the planks through which they pass; the waterways and beams so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, stern-post and transoms; the floors, keelson, and keel; the rudder and all its parts and hangings; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

23. If, after the above examination, the Owner should consent to take out all planks, timbers, beams, knees, waterways, fastenings, and other parts that may be found defective, or objected to, and replace them

with materials of the same species, or of equal quality to that required in vessels of two-thirds the number of years (by their timber material) of the ship's original construction, then such ships to be entitled to be Restored for a period not exceeding *one-half* the number of years originally assigned.

24. If, however, in addition to the above, or at any time during the term of Restoration, the ship be *diagonally* doubled, according to Section 68, then in the case of ships built of the 5 years' grade and under, 2 years additional will be allowed; if built of materials exceeding the 5 and under the 12 years' grade, 3 years additional; and if of 12 years' material, 4 years additional will be allowed.*

25. Ships Restored, to be subject to annual survey, and also to a half-time survey, as prescribed in Section 34.

26. Ships of 300 tons or above, Restored according to the foregoing Rule, will not be allowed a Continuation of the Character A at the expiration of the Restoration, unless they be diagonally doubled as prescribed in Section 68. But if they be under 300 tons, and exceeding 20 years of age, to be allowed a Continuation, the bottom planking must either be doubled, as prescribed in Section 68, or else renewed for half the length amidships from the second futtock-heads to the keel, in addition to the other requirements of Section 54.

SECOND RULE.

Section 57. 1. If, at any age of a vessel, the owner be desirous to have his ship Restored to the A character for a longer period than one-half her original classification, she must be subjected to the Special Survey hereafter described, to be held by two Surveyors, one of them to be an exclusive Officer of the Society, and all repairs found necessary must be completed to their satisfaction.

2. If the vessel be 300 tons or above, she must be diagonally doubled, as per Section 68, unless the whole of the planking from the keel to the height of the second futtock-heads be renewed,† when the doubling may be dispensed with.

3. But if she be under 300 tons, and exceeding twenty years of age, she must have the bottom planking renewed† for one half the length amidships from the second futtock-heads to the keel, or be diagonally doubled, as per Section 68.

4. Vessels which have undergone this rule will be entitled to be Restored for a period not exceeding two-thirds the number of years originally assigned (exclusive of any period which might have been previously assigned for doubling), and in addition, if the vessel be at this time diagonally doubled, in accordance with the Rules, Section 68, the term prescribed for such doubling will be allowed.‡

5. When extensive repairs are effected under this rule, and a large proportion of low class materials has been removed and replaced by wood of a higher grade, then, if additional fastenings have been introduced, and the workmanship is of a superior description, the vessel will receive the same consideration with a view to assigning her an improved Class under the Mixed Material Rule, Section 34, as in ships on their original construction.

* *As regards ships which have already had a prolonged term for doubling*, see *Section 68*.

† If the whole of the ceiling from the bilges downwards has been removed, and the edges of the outside planking and its general condition be found satisfactory, or if the outside planking shall have been recently renewed, the Committee will be prepared to give consideration to any application that may be made to them for a relaxation of the requirements above stated.

‡ In the case of Restoration of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

REQUISITES FOR RESTORATION.—SECOND RULE.*

Section 58. 1. The ship must be placed in dry dock or laid on blocks upon ways, so that the keel may be examined.

2. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.

3. The hold to be cleared, and proper stages made both inside and outside.

4. All the outside planking from the lower part of the chocks at floor-heads upwards, the stem knight-heads, hawse-timbers, stern-post, and rudder where exposed ; also the shelves, clamps, bilge planks ceiling and keelsons, to be scraped or dubbed bright.

5. All air-courses and the limbers to be cleared.

6. The upper deck waterways, spirketting, plankshеers, sheerstrakes, and topside planks, through which the upper deck shelf-lodging-knee and waterway bolts pass, to be removed.

7. Two planks in each bow and each buttock to be removed.

8. In all cases, the outside planks through which the chain and preventer bolts pass must be removed.

9. If the bolts in the range of the lower deck be *iron*, the outside planks through which they pass must be removed.

10. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the plankshеer, and one from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, also one to be driven out from every fourth timber, for half the vessel's length amidships on each side at the bilge, and at such other parts of the vessel as the Surveyors may direct, in order that the state of the treenails and the timbers and planking in the treenail holes may be ascertained.

11. If the fastenings in the range of the lower deck be of *iron*, *not through the outside planking*, one plank on each side is to be removed, so that the condition of these fastenings may be ascertained ; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts as the Surveyors may direct.

12. *Where the middle line bolts are of iron*, their condition is to be ascertained ; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keels in each alternate frame, also through the stem, apron, stern-post, and deadwood.

13. Two strakes of ceiling in the range of the first futtock-heads, and one strake in the range of the floorheads, to be removed on each side all fore and aft.

14. The strake of upper deck plank next the hatchways to be removed all fore and aft.

15. A strake of deck next the waterway or spirketting, on the hold or lower deck beams, to be removed.

16. All treenails, bolts, listings, and planking, removed for the examination of the vessel's condition to be from such parts as the Surveyors may direct.

17. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

18. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary the salt is to be renewed.

* If the vessel be *Salted* in accordance with Section 37 during repairs under the Second Rule for Restoration, she will be allowed the advantage of the Rule for Salting.

19. The condition of the oakum and caulking to be ascertained.

20. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

21. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.

22. When in the state above described, the ship to be submitted to a special survey and examination at which the attention of the Surveyors is to be particularly directed to the state of the upper deck and coamings, the upper and lower deck binding bolts, whether of iron or copper, and the planks through which they pass ; the beams, stem, apron, hawse-timbers, knight-heads, breast-hooks, stern-post, inner-post, and transoms ; the floors, keelson and keel ; the rudder and all its parts and hangings ; the planking outside and inside and the treenails ; the frame and inner surface of the outside planking, where they can be seen ; and the sheer and general form of the ship.

23. If, after the above examination, the Owner should consent to take out all planks, timbers, beams, knees, fastenings, and other parts that may be found defective, or objected to, and replace them with materials of the same species or of equal quality *to that required in vessels of two-thirds the number of years (by their timber material) of the ship's original construction*, and she be *diagonally doubled* as per Section 68, *or planking renewed as required by Section* 57, then she will be entitled to be restored for a period not exceeding two-thirds the number of years assigned originally, and the term allowed for doubling, viz., 2 years additional if built of wood materials of the five years' grade and under ; 3 years additional, if built of materials exceeding the 5 years' and under 12 years' grade ; and 4 years additional, if built of 12 years' material or above.

24. Ships thus Restored to be subject to annual survey, and to the half-time survey, as prescribed in Section 34.

CONTINUATION ON RESTORATION.

Section 59. 1. Ships which have been doubled when *Restored* (or in which the requirements of the last paragraph, Section 56, or the second and third paragraphs of Section 57, have been complied with) shall be entitled to Continuation, subject to the same conditions of survey and examination as are prescribed for ships proposed to be Continued at the expiration of the period first assigned to them (Section 54) ; but, in like manner, the term of such extended Continuation shall be limited to a period not exceeding one-third or two-thirds of the number of years for which the ships may respectively have been *Restored* (exclusive of time allowed for doubling), without any reference whatever to the period originally assigned to them.

EXPIRATION OF CHARACTER.

2. At the termination of the several periods assigned to ships for remaining on the Character A, or A in Red, they will have the word "*Expired*" inserted against them ; and if not surveyed prior to the reprinting of the Register Book, they will appear without any character.*

* The terms of years assigned to ships on the Character A, launched *previously to the 1st July*, 1859, also of ships launched during the *first* six months of the years 1860, 1861, 1862, and 1863, will expire on the 31st December of the last year of the periods assigned to them respectively.

The terms assigned to ships launched during the *last* six months of the years 1859, 1860, 1861, and 1862, will expire on the 30th June next after the last year of the periods assigned to them respectively.

In the case of ships launched on and after the 1st July, 1863, the period originally assigned to them on the A character, will in every case *date from the month* in which the vessel may be launched, and will expire at the end of the corresponding month in the year at which the period assigned terminates.

3. But if, during the *last year* of the period assigned to them, the Owners of a ship shall, in consequence of her being about to proceed on a distant foreign voyage, apply to have her surveyed for Continuation of the letter A, or for the Character A in Red, a special survey shall be held conformably to the Rules, Section 54 or 60, as the case may be; and if from the report of such Special Survey, the ship shall appear to be in all respects in a sound and efficient state, such as is required by those Rules, the Committee shall, from the period at which the ship's Character would terminate, continue on the letter A, or will assign to her the Character A in Red in accordance with the Rules referred to.

SHIPS CLASSED A, IN RED.

Section 60. 1. Ships found on survey to be of a superior description, being fit for the safe conveyance of dry and perishable goods, subject to the following conditions, shall be classed A in Red, as the Second description of the First class.

2. In all cases in which the Owner may claim this character, the ship must undergo a special survey by two Surveyors (to be appointed in every instance by the Committee), one of whom shall be an exclusive Officer of the Society. (*See* also Section 52 for Ships not built under Survey.)

3. Then if the following Survey, designated Survey No. 1, be complied with within twelve months of the expiration of the Character A, either on original Classification, Continuation, or Restoration, one-third of the number of years assigned originally, or such as might have been assigned, will be granted from the date of such Survey; *but, if this Survey be not complied with within the above stated time, the period named will commence from the expiration of the original Classification, Continuation, or Restoration.*

4. *If after the expiration of the period assigned, or which might have been assigned, under the* FIRST *Survey, the character* A *in red be sought, the following Survey, designated No.* 2, *must be complied with, when a period of two-thirds the number of years assigned originally, or such as might have been assigned will be granted from the date of such Survey.*

5. *The character* A *in red for a period of two-thirds the number of years originally assigned may, however, be obtained at* ANY *time, provided the requirements of Survey No.* 2 *be complied with.*

6. In the repair of vessels for the above character, no materials may be used of a description inferior to those allowed in new ships for the six years' grade, except in the case of vessels originally classed for a shorter period than six years, when materials equal to those used in the original construction will be permitted.

FIRST SURVEY FOR A, IN RED.

7. The ship must either be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined.

8. To be scraped or dubbed bright from the light water-mark upwards, including the plank sheers and waterways, so as to expose the surface of the plank to view.*

* If the ship has been sheathed with wood over felt within a period of five years, and the plank from the light water-mark upwards shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained, and favourably reported upon by the Surveyors, the stripping from the light water-mark upwards may, on application to the Committee, be dispensed with, provided the sheathing which covers the raft-ports and binding-bolts, and a strake of sheathing all fore and aft on each side under the wales be removed, and listings of sheathing be cut out at hood ends, and the planking, fastenings, and caulking so exposed shall prove to be in good condition; but, whenever the sheathing is removed, the outside planking is to be scraped or dubbed bright and examined as prescribed by the above Rules.

If the ship has been sheathed with metal within a period of two years, and it shall appear to the Surveyors that stripping from the light water-mark upwards may be dispensed with, the case will receive due consideration on application to the Committee.

9. The hold to be cleared, and proper stages to be made both inside and outside.

10. All air-courses and the limbers to be cleared.

11. The condition of the timbers of the frame to be further ascertained by a *new* listing not less than 4 inches wide, being *cut* out of the ceiling at each end of the hold on each side, between the keelson and air-course under the hold-beam clamp, for one-fifth the entire length of the ship.

12. One treenail to be driven out from every alternate frame or fourth timber between the upper edge of the wales and the plankshеers, and one from every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers, and planking in the treenail holes.

13. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

14. If the fastenings in the range of the lower deck be *of iron, not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts, as the Surveyors may direct.

15. All treenails, bolts, and listings, removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

16. *Where the middle line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, stern-post, and deadwood.

17. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

18. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary the salt is to be renewed.

19. The condition of the oakum and caulking to be ascertained.

20. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

21. The anchors, cables, masts, spars, and general equipment to be attended to as prescribed in Sections 72 to 76.

22. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and coamings; the upper and lower deck bolts, whether of iron or copper, and the planks through which they pass; the plankshеers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, stern-post, inner-post, and transoms; the floors keelsons, and keel; the rudder and windlass; the planking outside and inside, and the treenails; the frame and inner surface of the outside planking, where they can be seen; and the sheer and general form of the ship.

23. The ship to be efficiently repaired with suitable materials.

24. The term for which a vessel may be assigned the Character A in Red, upon a compliance with the foregoing requirements, will not exceed one-third the number of years of that assigned originally, or such as might have been assigned, subject to the usual annual survey, and also to the half-time survey, as prescribed in Section 34.

25. If, however, in addition to the above, the ship be *diagonally* doubled according to Section 68, then, in the case of ships built of wood materials of the 5 years' grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under the 12 years' grade, will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional,* provided a strake all fore and aft at the upper edge of the doubling, or the plank-sheers be removed.

SECOND SURVEY FOR A, IN RED.

26. For the purpose of holding such Survey, the ship must be placed in dry dock, or laid on blocks upon ways, so that the keel may be examined. (*See also* Section 52 for ships not built under Survey.)

27. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.†

28. All the outside planking, from the light water-mark upwards, including the plank-sheers and waterways, to be scraped or dubbed bright.

29. The hold to be cleared, and proper stages made both inside and outside.

30. All air-courses and the limbers to be cleared.

31. The condition of the timbers of the frame to be further ascertained by the removal of all the treenails in one strake in the topsides fore and aft, on each side, and by the removal of two planks on each side above the wales, except in vessels of 200 tons, or under, when the removal of *one* plank on each side will be deemed sufficient.

32. In addition, a plank to be removed in each bow and each buttock.

33. One treenail to be driven out from every alternate frame or fourth timber, between the upper edge of the wales and the light water-mark, and at such other parts of the topsides and bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of the treenails, and the timbers and planking in the treenail holes.

34. If the whole of the treenails from the light-water mark upwards have to be renewed, the removal of a plank in each bow and buttock will be sufficient, provided the timbers in the treenail holes be examined and found in good condition.

35. Bolts, if of iron, in number not less in any case than six on each side, in the range of each tier of beams to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship.

36. If the fastenings in the range of the lower deck be *of iron, not through the outside planking*, one plank on either side is to be removed, so that the condition of the fastenings may be ascertained; if they are not in a satisfactory condition, the vessel must be through-bolted in these parts, as the Surveyors may direct.

* *In the case of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.*

† If the ship has been sheathed with wood over felt, within a period of five years, and the plank shall, when so sheathed, have been brightened, and the condition of the bolts, planking, treenails, and caulking ascertained and favourably reported upon by the Surveyors, the stripping of the wood sheathing may, on application to the Committee, be dispensed with; provided that the sheathing, which covers the binding-bolts, and raft-ports, and a strake of sheathing all fore and aft on each side under the wales be removed, and listing of sheathing be cut out at hood ends; and the planking, fastenings, and caulking so exposed shall prove to be in good condition; but, whenever it is removed the outside planking is to be scraped or dubbed bright, and examined as prescribed by the above Rule.

37. *Where the middle-line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, apron, stern-post, and deadwood.

38. Plank, or a *new* listing of ceiling, of sufficient breadth (not less than four inches wide), at the discretion of the Surveyors, to be cut out of the ceiling in the range of the floor-heads, or at such height as may in the judgment of the Surveyors best expose the timbers of the frame to view, at each end of the hold for one-fifth the entire length of the ship, and for the remaining three-fifths of the ship's length the state of the timbers to be ascertained by driving out a treenail from every fourth timber in one or other of the strakes of the bilge planking. If the Shipowner should prefer it, planking may be removed *outside*, at each end of the ship, in the range of the floor-heads.

39. In order to ascertain the condition of the upper deck beam ends, a strake of deck next the waterways on each side to be taken out, except where it is covered by a poop, or a forecastle, and where this exception arises the strake should be removed as far aft as the first beam within the poop, and as far forward as the first beam within the forecastle. On the decks below, as well as on the upper deck beyond the above limits, the plank need not be removed, provided the beams be tested by boring and sounding and be found good.

40. All treenails, bolts, listings, and planking removed for the examination of the vessel's condition, to be from such parts as the Surveyors may direct.

41. All yellow metal bolts to be tested where practicable, to ascertain if any are broken.

42. In the case of vessels allowed an additional year in classing for salting under Section 37, the state of the salting throughout is to be ascertained and reported upon, and, if necessary, the salt is to be renewed.

43. The condition of the oakum and caulking to be ascertained.

44. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

45. The anchors, cables, masts, spars and general equipment to be attended to as prescribed in Sections 72 to 76.

46. The attention of the Surveyors shall then be particularly directed to the state of the upper or main deck and coamings; the upper and lower deck bolts, whether of iron or copper, and the planks through which they pass; the plank sheers, waterways, and beams, so far as they can be examined; the stem, apron, hawse-timbers, knight-heads, breast-hooks, stern-posts, inner-post, and transoms; the floors, keelsons, and keel; the rudder and windlass, the planking outside and inside, and treenails, the frame and inner surface of the outside planking, where they can be seen, and the sheer and general form of the ship.

47. The ship to be efficiently repaired with suitable materials.

48. To entitle them to continue this Character, such ships will be required, in addition to the usual annual survey, to undergo the half-time survey as prescribed in Section 34, and to undergo a special re-survey as prescribed above, within a period (from the date of the last special re-survey) not exceeding *two-thirds* of the several terms of years originally assigned to them, or earlier, if, in the judgment of the Surveyors, upon a careful examination of the ship, the same shall appear to them to be necessary.

49. If, however, in addition to the above, the ship be *diagonally* doubled, and the other requirements be complied with, according to Section 68, then, in case of ships built of wood materials of the 5 years grade and under, they will be allowed 2 years additional on account of such diagonal doubling; those built of materials exceeding the 5 and under the 12 years' grade, will be allowed 3 years additional; and those built of 12 years' materials and upwards, 4 years additional. *

SHIPS CLASSED Æ.

Section 61. 1. Ships that have passed the prescribed age for the A Character, but have not undergone the repairs which would have entitled them to be Continued or Restored; or having been Continued or Restored, or classed A in Red, and the additional period thus assigned expired, and also such ships as have never had an original character, which shall be found on survey fit for the conveyance of dry and perishable goods on *shorter voyages*, shall be distinguished by the diphthong Æ, upon compliance with the undermentioned Survey. (*See also* Section 52 for Ships not built under Survey.)

SURVEY.

2. The ship to be placed on blocks, so that the keel and bottom may be seen and properly examined and the caulking tested.

3. The hold to be cleared and proper stages made both inside and outside.

4. The limbers and all air-courses to be cleared.

5. A listing to be cut out of the ceiling, not less than four inches wide, in the range of the floor-heads or at such height as may, in the judgment of the Surveyors, best expose the timbers of the frame to view, at each end of the hold on each side for one-fifth the extreme length of the vessel.

6. The outside planking to be scraped bright where the Surveyors may consider it to be necessary from any apparent defect.

7. Bolts of lower deck (if of iron) in number not less than six on each side, and treenails in number not less than twelve on each side, to be driven out at various parts of the ship.

8. The attention of the Surveyors is to be then particularly directed to the state of the upper or main deck and coamings, the upper and lower deck bolts, *whether of iron or copper*, and the outside planks through which they pass, and to all other parts of the ships, so far as they can be examined.

9. The windlass to be unhung and its wood lining sufficiently stripped for examination; and the chain cables to be removed from the lockers and ranged, and, with the anchors, masts, spars, and general equipment, examined so as to be satisfactorily reported upon.

10. *Where the middle-line bolts are of iron*, their condition is to be ascertained; but, if this be not practicable, additional bolts of sufficient size must be driven through the keelson, floors, and keel in each alternate frame, also through the stem, sternpost, and deadwood.

11. If the Æ Character be then assigned, it shall be continued, subject to an annual survey for a period not exceeding four years, at the expiration of which time the Character will be discontinued unless the vessel be again submitted to a similar Special Survey.†

* In the case of ships previously doubled, or ships of peculiar construction, special application may be made to the Committee.

† For doubling of ships of the above Class, *see* Section 68.

BRITISH NORTH AMERICA AND ALL FIR SHIPS.*

Section 62. 1. Ships built in the British North American Colonies, and all ships wherever built the frames of which are composed of *Fir*, of 400 tons and above, shall, in order to entitle them to be classed in the Register Book of the Society, be secured in their bilges by the application of iron knee riders, or hanging-knees and riders to cover the joints of the floor and futtock-heads, to extend from the height of the hold beams to the floors so as to receive not less than two bolts in a substantial part of the floors.

2. The number of iron knees and riders to be not less than one of each to every hold or lower deck beam on each side. The knees to be connected with riders or not, at the option or convenience of the Owners, but if not so connected, the side arms of the knees are to be of the length and to be fastened as prescribed in Table F. "*Jumped knees*" will not be allowed.

3. The number of knees to each deck, and of riders, also their dimensions, and number of bolts, are fully explained in Table F.

4. All ships built in the Colonies will be considered as "iron fastened" in their centre lines, unless it shall be satisfactorily shown to the contrary, either by the exposure of some of the bolts or by a certificate to be produced from the Builders.

5. Ships which proceed to sea *without being fastened with the iron knees and riders prescribed by the Rules*,† *will have One Year deducted* from the period to which they would otherwise be entitled to be classed in the Register Book.

BRITISH NORTH AMERICAN BUILT SHIPS.

Section 63. 1. All British North American built ships, which have gone, or may go off the List of Ships of the A character, or which may be of an age exceeding the period for which they might have had claims to be put upon that grade (whether classed or not), shall, as from time to time they come under examination, be subjected to a careful Survey, to be made by one of the Surveyors to this Society;—and no further Character shall be assigned them unless a Survey shall be held as follows; either by removing planking *outside*, equal in breadth to an entire strake for one-fifth the length of the vessel forward and aft on both sides, or by cutting listings *inside* five inches wide to the same extent in the fore and aft bodies in line with the upper turn of bilges, or at such height as may, in the judgment of the Surveyors, best expose the timbers of the frame to view, and for the remaining three-fifths of the vessel amidships the state of the timbers to be ascertained by driving out a treenail in every fourth timber in one or other strake of bilge planking. A special report of the state of these timbers, and of the general state and condition of the upper deck fastenings, waterways, spirketting, plankshears, topsides, upper deck with its appendages, lower deck fastenings, wales, counter, plank and treenails outside to the water's edge, rudder, windlass and capstan, beams and breast-hooks, shall then be transmitted by the Surveyor to the Committee; and on the receipt of such report the character shall be assigned.

2. *If, in addition to the requirements contained in Section 61, the above Survey be complied with and the Æ Character be assigned, it shall be Continued, subject to an annual Survey, for a period not exceeding four years, at the expiration of which time the Character will be discontinued unless the vessel be again submitted to a similar Special Survey.*

* *See also* Section 39, paragraph 5.

† This applies not only to British North American ships, but to all wooden vessels.

SHIPS CLASSED E.

Section 64. Will comprise all ships which shall be found on Survey fit for the conveyance of cargoes not in their nature subject to sea-damage.

Section 65. 1. To entitle vessels to this Character they must be subjected to the following Survey.

2. To be placed on blocks so that the keel and bottom may be examined, and the caulking tested. Treenails, not less than twelve on each side, to be driven out at various parts of the ship, for the purpose of ascertaining their condition and that of the timbers and planking through which they pass.

3. The windlass to be examined, and the chain cables to be ranged, and the equipment generally examined and reported upon.

4. If the E Character be then assigned, it shall be Continued, subject to an annual survey, for a period not exceeding three years, at the expiration of which time the Character will be discontinued unless the vessel be again submitted to a similar Special Survey.*

Section 66. The Classification of Ships with the Character I, is discontinued.

CAULKING.

Section 67. 1. The bottom of every ship is to be CAULKED† once in every five years, unless wood-sheathed and felted and then once in every seven years, except in the case of *Teak-built ships*, upon which a Special Survey may have been requested, and the Surveyors having ascertained, by the removal of a strake of sheathing fore and aft under the wales, and a strake at the first futtock-heads, and by causing listings to be cut out at the hood ends, that such caulking is not required, the same may then be dispensed with.

2. If any ship shall be stripped within the periods above mentioned, her bottom is to be caulked, *if necessary*. (*See* Section 70.)

DOUBLING.

Section 68. 1. In all cases in which ships may be doubled, doubling of not less than the thickness hereinafter mentioned will be required, the same to be properly wrought and fastened as follows: in every instance the doubling is to be at least single fastened either with treenails or with bolts,‡ and a through-bolt in every butt. If treenails be used, every treenail must, if practicable, be a through fastening; and, if bolts be used, then one-sixth of them from the lower part of the bilge upwards must be through and clenched on the ceiling in addition to the butt bolts. In all cases of doubling, the rudder braces are to be removed.

* For doubling of Ships of the above class, *see* Section 68.

† In cases where ships have been doubled with doubling of less thickness than is required by, or not fastened in accordance with, the Rules, it will not be imperative that such doubling be stripped at the expiration of seven years, as required for ordinary sheathing; but, if, upon Survey, the doubling be found in good condition, the period for its remaining on may be extended, with the sanction of the Committee, to a term not exceeding ten years, provided the doubling below the wales be copper or yellow metal fastened or treenailed.

‡ In ships hereafter doubled and sheathed with copper or yellow metal, if the doubling be fastened exclusively with bolts, the same must be of copper or yellow metal.

If the doubling be fastened with treenails and bolts, as described in the above section, and the bolts be of iron, the vessel must be subjected to a Special Survey, and bolts at the discretion of the Surveyor be driven out to ascertain their condition; such surveys to be held within periods not exceeding three years, and whenever the copper or yellow metal sheathing is stripped.—*6th July, 1876.*

2. The throat bolts of iron knees, and the bolts of iron hooks, crutches and pointers, must be renewed through the doubling.

3. The thickness of the doubling for the wales and bottom, on ships

Under 400 tons to be not less than	2 inches
of 400 „ and under 600 tons	$2\frac{1}{2}$ „
of 600 „ and above	3 „

4. On the topsides of ships not exceeding 300 tons, the thickness may be $1\frac{1}{2}$ inches.

5. No ship hereafter doubled shall be entitled to the Character A, or A in Red, unless at the time of doubling it be ascertained, in either case, that the frame is capable of securely retaining the fastenings, *by one treenail being driven out in every alternate frame or fourth timber between the upper edge of the wales and the light water-mark, and at such other parts of the bottom as the Surveyors may direct, so as to enable a judgment to be formed as to the general state of treenails and timbers, and of the planking in the treenail holes*, or should the state of the treenails indicate defective timbers, or should the outside planking be bolt-fastened, then, by cutting out listings or plank at the discretion of the Surveyor.

6. Before doubling, the original fastenings in the outside planking and the rider bolts should be ascertained to be in efficient condition, or be made good, but all treenails, from *the upper part of chocks at second futtock-heads to the lower part of chocks at floor-heads to be renewed with through treenails of hard wood for at least half the length of the ship amidships*, unless the Surveyors, by having a sufficient number driven out, fully satisfy themselves that they are well made, tightly driven, and in good condition.

DIAGONAL DOUBLING.

7. If the doubling be applied diagonally, on the wales and bottom, it will be allowed to be of the following thicknesses, viz. :—

In ships under 500 tons	$1\frac{1}{2}$ inches
„ of 500 tons and under 1,000 tons ...	2 „
„ 1,000 tons and upwards	$2\frac{1}{2}$ „

8. *Diagonal* doubling on ships is to be fastened as under, viz. :—

9. If worked not above 11 inches broad, it may be single fastened with a through bolt at every butt, every *fifth* fastening to be a through bolt or a through treenail of hard wood; the distance between these through fastenings not to exceed 4 ft. 6 in. The remaining fastenings to consist of through treenails or two long and two short dump bolts; the length of the short dumps may be half an inch less than the combined thickness of the doubling and the original outside plank, and that of the long dumps to be not less than the thickness of the doubling added to twice the thickness of the original outside plank.

10. At the upper edge of the doubling, which is to be sufficiently high to enable the butt bolts of the diagonal planks to pass through the lower deck spirketting, a strake of planking is to be taken out fore and aft, and a strake is to be worked in its place, on the timbers, sufficiently thick to project to the outside of the doubling. The butts of the diagonal doubling are then to be rabbeted into this thick strake ; or a fore and aft strake of doubling may be worked below the thick strake, and be rabbeted into it, and the butts of the diagonal doubling may be butted against this fore and aft strake. Or, if the strake of planking is not removed and the thick strake is not worked, there must be at the upper end of the diagonal doubling a fore and aft strake, having its upper edge let into the original plank sufficient to form a caulking seam, say

not less than 1½ inches. The lower ends of the diagonal doubling to be worked against two strakes of fore and aft doubling, the lower edge of the lower strake being rabbeted into the keel, and to be not less in thickness than one and a half times the thickness of the doubling. All diagonal doubling to be of rock elm or of equally suitable material, and be wrought on hair felt.

EXTENSION OF CLASS FOR DIAGONAL DOUBLING.

11. Ships diagonally doubled in conformity with the Rules, after the expiration of twelve months from the date of launching, shall be allowed an extended period of classification to the extent described hereafter.

12. Also ships surveyed for Continuation, Restoration, and the Character A 1 in Red, which shall be diagonally doubled in conformity with the rules, shall, on account of such doubling, be allowed an extension of the term otherwise assigned to them as under, viz. :—

13. Ships built of wood materials of the 5 years' grade and under, shall be allowed 2 years additional on account of being doubled diagonally; those built of materials exceeding the 5 and under the 12 years' grade, shall be allowed 3 years additional; and those built of 12 years' materials, 4 years additional.

14. To entitle ships to the advantages of this Rule when surveyed for Continuation, under Survey No. 2, Section 54, or for A in Red under Second Survey, Section 60, it will be necessary, in addition to the other requirements of the Rules, that in *flush-decked Vessels* the plankshеer be removed on each side all fore and aft, so as to expose the heads of the timbers and the back of waterways to view; also that a strake of upper deck next the waterway be taken out all fore and aft, and the beams of the decks below be tested by boring and sounding. But in ships having a poop and forecastle, it will be necessary to remove the plankshеer on both sides from the poop to the forecastle, and the mouldings in continuation of the plankshеer forward and aft; or a portion of a strake of topside planking from the fore part of the poop aft, and from the after part of the forecastle forward; but it will not be necessary to remove planking of topsides from poop to forecastle where the plankshеer has been removed, if the timbers thus exposed are in good condition; nor the strake of deck abaft the first beam within the poop and before the first beam within the forecastle, provided the beams are tested by boring and sounding and be found good.

15. If a ship be doubled at the time she undergoes the Continuation Rule, 1st Survey, or the 1st Rule for A in Red, the removal of a strake all fore and aft at the upper edge of the doubling may be substituted for the removal of the plankshеer.

16. A similar relaxation of the Rule will, upon special application to the Committee, be allowed in the case of spar-decked ships.

FURTHER EXTENSION OF CLASS FOR DIAGONAL DOUBLING.

17. Ships which have been diagonally doubled in conformity with the Rules, Section 68, and have received an extension of class from the same, may, at a subsequent period, either on the expiration of the period of continuation under the second rule, or of Restoration, or of second continuation upon Restoration, or second Survey for A 1 in red, receive a *further extension* of class for diagonal doubling, provided the following Survey be complied with, and the vessel be found or placed in good and efficient condition.

18. The period of this *further extension* to be 3 years in the case of vessels built of materials of the 12 years' grade and above, and 2 years in the case of vessels where the timber materials are below the 12 years' grade.

SURVEY.

19. The ship to be placed on blocks in dry dock, or on ways, so that the keel and bottom may be seen and properly examined (unless she has been thus surveyed by the Society's officers within the previous twelve months); the hold to be cleared, and proper stages made both inside and outside; the limbers, and all air-courses to be cleared; and, if the ship has not already got the air-courses described in Section 37, they are now to be made; the outside planking to be scraped bright where the Surveyors may consider it to be necessary from any apparent defects; bolts of lower deck (if through of iron) in number not less than three on each side, and treenails in number not less than twelve on each side, to be driven out at various parts of the ship, and all parts of the ship, and the equipment to be thoroughly examined, in order to ensure the vessel being in good and efficient condition, and worthy of the extension of class herein contemplated.

20. Such Ships to be marked in the Register Book thus:—dia. d. 3 yrs. or 2 yrs., as the case may be.

DOUBLING OF VESSELS CLASSED Æ and E.

21. All vessels of the Æ or E class, or vessels unclassed, which may be found on Survey to be, from *local* defects, in a condition requiring considerable opening out and consequent repairs, to entitle them to a class in the Register Book, or to continue on their class, may be rendered eligible for classification, or for the Æ character, provided they be diagonally doubled, the thickness of the same being from one inch in thickness and upwards, according to the size of the vessel.

22. In all such cases, however, the local Surveyor should forward a report, setting forth the condition of all parts of the vessel, and the mode of doubling proposed to be adopted, for the sanction of the Committee.

23. A careful examination is to be made of the condition of the original fastenings, and the planking of the bottom, &c., before the doubling is fitted, and the Surveyors are to satisfy themselves that the timbers of the frame and planking are sufficiently sound to receive the fastenings.

24. When the doubling is under two inches in thickness it may be fastened with short bolts, spikes or nails, galvanized, on the alternate edges not exceeding twelve inches apart; the length of the bolts, spikes or nails, may be one inch less than the combined thickness of the doubling and outside planking with longer intermediate bolts in the butts and about five feet apart, driven into the timbers of the frame.

25. When the doubling is two inches in thickness or above, in addition to the above fastenings, the butt bolts must be through and clenched.

26. The doubling in all cases is to be rabbeted into the stem, stern-post, and keel and a strake of longitudinal doubling is to be fitted adjoining the keel, and to be one-half an inch thicker than the diagonal doubling, if the latter be two inches or less in thickness.

27. Should the Æ character be then assigned, the same will be continued, subject to annual Survey,

provided once in every four years the keel and bottom be surveyed, and the caulking tested, and the hold cleared; the windlass unhung and chain cables ranged, and the equipments and general condition of the vessel be found satisfactory. (For periodical Surveys of ships classed E, *see* Section 65.)

28. Where modifications are desired, Shipowners may submit their proposals for the approval of the Committee through the resident Surveyor.

IRON-FASTENED SHIPS.

Section 69. All ships, although iron-fastened (except as hereinafter mentioned), shall be classed in the same manner as copper-fastened ships, so long as they remain unsheathed with copper, provided they are, in all other respects, constructed in accordance with the Rules; but, when sheathed with copper over the iron fastenings, the words "Coppered over Iron Bolts" shall be added to the Character in the Register Book, and continued until the ship be thoroughly copper-fastened.

SHIPS BUILT IN INDIA.

Section 70. Ships built in India, although fastened with iron, shall be permitted to be copper-sheathed without any mark being placed in the book, provided the bottom be felted or chunamed and wood-sheathed, and subjected to a careful examination of the iron fastenings on every occasion on which the sheathing is stripped off, for which purpose some of the bolts and nails are to be taken out of the lower part of the bottom, and to be seen by the Surveyor; but no such ship shall be permitted to continue either on the A or on the A in Red class for a longer period than one-half the number of years beyond the term originally assigned for her remaining on the A Character, unless the bottom shall have been doubled, or the whole of the iron fastenings taken out or properly secured, and the bottom refastened with bolts, or treenails, or both, including the middle line, breast-hook, and crutch bolts. (*See* Section 67.)

RUDDER, PUMPS, WINDLASS, HAWSE-PIPE, &c.

Section 71. 1. The rudder, pumps, windlass, or capstan, scuppers, hawse-pipes, chain-plates, and side-lights to be good and efficient; and the windlass, if of wood, is in all cases to have a through square iron spindle, ranging from $2\frac{1}{2}$ to 5 inches square, according to tonnage.

2. The hawse-pipes must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass, or capstan.

EQUIPMENT.

Section 72. 1. All vessels are required to have their masts, spars, and rigging in good order, and sails in sufficient number and in good condition.

2. Every ship is to be provided with anchors, cables, &c., of approved quality, properly tested at a *public machine*, in number and length, as set forth in the Table, No. 22, annexed. (*See also* Section 32).

3. In cases, however, where anchors and chain cables are manufactured abroad and supplied to *foreign owned vessels*, and testing certificates are furnished setting forth that the anchors and chain cables have been tested at a Government machine, or a machine under the control of a municipal body, or a similar

responsible body, such certificates will be accepted as complying with the requirements of the Rules, for obtaining the Figure 1, provided the remaining requirements of Table 22 be complied with, but in these cases the record of A.&C.P. will not be made in the Register Book.

4. A Certificate of all Chains and Anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the Figure 1.

Section 73. The length and condition of the Chain Cables are to be ascertained by removal from the lockers on every Special Survey for Classification.

Section 74. In all cases where hempen cables are used, one-sixth more in length will be required.

BOATS.

Section 75. All vessels under 150 tons to be provided with one good boat; and every vessel of 150 tons and above to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of *all* vessels.

Section 76. 1. The efficient state and condition of the whole of the ship's equipment will be designated by the Figure 1; and where the same is found insufficient in quantity, or defective in quality, by a dash thus — following the character assigned to the ship.

DEFECTIVE EQUIPMENT.

2. In the case of a steam vessel already classed, of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the Figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the Figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel, in the Register Book; but, where in the opinion of the Committee the machinery or boilers are deemed so far inefficient and defective as to imperil the vessel's safety, the Figure 1 will be withheld, and a red ring inserted in place thereof; and, in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the Figure 1 for equipment; as described in the Key to the Register Book; and it is to be understood that, although, for facilities in contracting, a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules. (*See also* Section 78.)

SHIPS NAVIGATED BY STEAM.

Section 77. Steam ships are to be subject to the same periodical surveys as sailing vessels, and whenever the boilers are taken out the vessel is to be submitted to a particular and special Survey, in order to ascertain her general condition. (*See* Section 78.)

RULES FOR THE SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 78. 1. In steam vessels, the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them in the manner shown in form No. 8 annexed. If found satisfactory, the Committee will thereupon grant a certificate, and insert in the Register Book the notification, "LMC" *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

ORDINARY SURVEY OF NEW ENGINES OR BOILERS WILL BE AS FOLLOWS.

2. On the different parts of the engines during erection.

3. On the sea connections while being fitted to the vessel.

4. On the boiler plates when they are bent, flanged and holed, ready for riveting, and on stays, &c., while being fitted.

5. Testing the boilers by hydraulic pressure.

6. When engines and boilers are being fixed on board the vessel.

7. At the setting and testing of safety valves and trying the machinery under steam.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

8. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

9. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠LMC" or "✠NE&B," or "✠NB."

10. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined and from them the working pressure fixed.

11. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.

12. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

13. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 45.)

14. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

15. The boilers, together with the machinery, to be inspected at different stages of construction.

16. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

17. Two safety valves to be fitted to each boiler, and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60lbs. per square inch, the safety

valves may be loaded to 5lbs. above the working pressure. If common valves are used their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case to exceed 10 per cent. of the working pressure.

18. An approved safety valve also to be fitted to the super-heater.

19. In winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

20. Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers and be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

21. Stop-valves to be fitted so that each boiler can be worked separately.

22. Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

23. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside planking.

24. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

STEEL BOILERS.

25. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*See* Circular, No. 438*) :—

1. The material of stays and of plates is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.

   In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*

   It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red, and quenched in water of 82° Fahrenheit.

2. Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.

4. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

6. No steel stays are to be welded.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

26. The engines are to be fitted with two feed-pumps, each capable of supplying the boilers; the pumps, &c., to be so arranged that either can be overhauled whilst the other is at work.

27. The engines are to be fitted with two bilge-pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

28. In engines of 70 H.P. and under, one feed-pump and one bilge-pump will be deemed sufficient provided they are of adequate capacity.

The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators for controlling their speed. If only one such pump is fitted for the main feed, the auxiliary feed pump required by paragraph 31 should also be fitted with an automatic speed regulator.

29. A bilge injection, or a bilge suction to the circulating pump, is to be fitted.

30. The engine bilge-pumps are to be fitted capable of pumping from each compartment of the vessel. The mud boxes and roses in engine room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

31. A steam pump is to be provided capable of supplying the boilers with water; this pump to be provided with suctions to the hotwell and also to the sea. A steam pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine room, it must be fitted to be worked by hand. In small vessels in which only one steam pump is fitted, it must comply with all these requirements.

32. In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes, and all main steam pipes are to be tested by hydraulic pressure to twice the working pressure, in the presence of the Engineer Surveyor.

33. All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge-valves fitted on the plating of the vessel in an accessible position.

34. No pipes to be carried through the bunkers without being properly protected.

35. Bilge suction-pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

36. All shafts to be examined when rough turned and finished.

37. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, see the formula in paragraph 46.

STEEL CASTINGS.

38. **Steel Castings** may be used for engine purposes provided they fulfil the Committee's requirements, which are as follow :—

For purposes for which **Cast Iron** is ordinarily employed, such as propeller bosses and blades, bed plates, engine framing and columns, brackets, weigh-shaft levers, pistons, cylinder covers, eccentric straps, bearing bushes, &c., the casings must be sound, and are to be subjected to such drop and hammering tests as are practicable.

For shafts or parts of shafts, and for purposes for which **forgings** are ordinarily employed the material must be subjected to the following tests :—

A tensile test is to be made from a piece taken from each casting. The tensile strength is not to exceed 30 tons per square inch, and the elongation is not to be less than 10 per cent. in a length of 8 inches, and a cold bending test, turned to $1\frac{1}{4}$ inches diameter or planed to $1\frac{1}{4}$ inches square, is to be capable of being bent without fracture through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.

All steel castings are to be thoroughly annealed.

COCKS, PIPES, AND SEA CONNECTIONS.

39. With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and vessels having *new engines or boilers* :—

40. All sea-cocks to be fitted above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

41. The blow-off cocks are to be fitted with spigots passing through the planking, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

42. Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

43. The arrangements of pumps, bilge injections, suction and delivery pipes, to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

SPARE GEAR.

44. The articles of spare gear mentioned in the following list will be required to be carried in al steam vessels classed in the Society's Register Book, viz. :—

2 connecting rod or piston rod top-end bolts and nuts.
2 connecting rod bottom-end bolts and nuts.
2 main bearing bolts.
1 set of coupling bolts.
1 set of feed and bilge pump valves.
1 set of piston springs (where common springs are used).
A quantity of assorted bolts and nuts.
Iron of various sizes.

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft.
Propeller shaft.
Propeller, or a full set of blades.
Stern bush, or lignum vitæ lining for bush.
1 pair of connecting rod brasses.
1 pair of cross head brasses.
1 set of link brasses.
1 eccentric strap complete.
Air pump rod.
Circulating pump rod.
H. P. valve spindle.
L. P. valve spindle.
1 set of check valves.
6 cylinder cover bolts.
6 junk ring bolts.
4 valve chest cover bolts.
2 dozen boiler tubes.
3 dozen condenser tubes.
1 cylinder escape valve and spring.
1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS OF IRON BOILERS.

45. The strength of circular shells of iron boilers to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where C = co-efficient as per following table.
T = thickness of plate in inches.
D = mean diameter of shell in inches.
B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100.$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$$B = \frac{n \times a}{p \times T} \times 90 \text{ with iron rivets in iron plates with drilled holes.}$$

(In case of rivets being in double shear, $1{\cdot}75a$ is to be used instead of a.)
where p = pitch of rivets.
d = diameter of rivets.
a = sectional area of rivets.
n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula, the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$-inch thick and under.	For Plates $\frac{3}{4}$-thick and above $\frac{1}{2}$-inch.	For Plates above $\frac{3}{4}$-inch thick.	
Lap Joint, Punched Holes.....	155	165	170	
Lap Joint, Drilled Holes	170	180	190	
Double Butt Strap Joint, Punched Holes.....	170	180	190	
Double Butt Strap Joint, Drilled Holes	180	190	200	

Note.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

CYLINDRICAL SHELLS OF STEEL BOILERS.

The strength of cylindrical shells of steel boilers is to be calculated from the following formula :—

$$\frac{C \times (T - 2) \times B}{D} = \text{working pressure in lbs. per square inch.}$$

where D = mean diameter of shell in inches.

T = thickness of plate in sixteenths of an inch.

C = 20 when the longitudinal seams are fitted with double butt straps of equal width.

C = 19·25 when they are fitted with double butt straps of unequal width, only covering on one side the reduced section of plate at the outer lines of rivets.

C = 18·5 when the longitudinal seams are lap joints.

B = the least percentage of strength of longitudinal joint found as follows :—

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times t} \times 85$ where steel rivets are used.

$B = \frac{n \times a}{p \times t} \times 70$ where iron rivets are used.

where p = pitch of rivets in inches.

t = thickness of plate in inches.

d = diameter of rivet holes in inches.

n = number of rivets used per pitch in the longitudinal joint.

a = sectional area of rivet in square inches.

In case of rivets in double shear 1·75a is to be used instead of a.

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the preceding tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted, to be stayed from the top of the dome or otherwise stiffened.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the smallest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

Iron Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, and for all stays which are welded, 6,000 lb. per square inch ; for unwelded stays above $1\frac{1}{2}$ inches smallest diameter, 7,500 lb. per square inch.

Steel Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 8,000 lb. per square inch ; for stays above $1\frac{1}{2}$ inches smallest diameter, 9,000lb. per square inch. No steel stays are to be welded.

Stay Tubes.—The stress is not to exceed 7,500 lbs. per square inch.

FLAT PLATES.

The strength of flat plates supported by stays to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

P = greatest pitch in inches,

C = 90 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with screw stays with riveted heads,

C = 100 for iron or steel plates above $\frac{7}{16}$ fitted with screw stays with riveted heads,

C = 110 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with stays and nuts.

C = 120 for iron plates above $\frac{7}{16}$ thick, and for steel plates above $\frac{7}{16}$ and under $\frac{9}{16}$ thick, fitted with screw stays and nuts.

C = 135 for steel plates $\frac{9}{16}$ thick and above, fitted with screw stays and nuts,

C = 140 for iron plates fitted with stays with double nuts.

C = 150 for iron plates fitted with stays with double nuts and washers outside the plates, of at least $\frac{1}{3}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 160 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, of at least $\frac{2}{5}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 175 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, when the washers are at least $\frac{2}{3}$ of the pitch in diameter and of the same thickness as the plates.

For iron plates fitted with stays with double nuts and doubling strips riveted to the outside of the plates, of the same thickness as the plates, and of a width equal to $\frac{2}{3}$ the distance between the rows of stays, C may be taken as 175, if P is taken to be the distance between the rows, and 190 when P is taken to be the pitch between the stays in the rows.

For steel plates, other than those for combustion chambers, the values of C may be increased as follows :—

C = 140 increased to 175,
150 „ 185,
160 „ 200,
175 „ 220,
190 „ 240,

If flat plates are strengthened with doubling plates securely riveted to them, having a thickness of not less than $\frac{2}{3}$ of that of the plates, the strength to be taken from

$$\frac{C \times (T \times \frac{t}{2})^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where t = thickness of doubling plates in sixteenths, and C, T and P are as above.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

For steel tube plates in the nest of tubes the strength to be taken from

$$\frac{140 \times T^2}{P^2} = \text{working pressure in lbs. per square inch;}$$

where T = the thickness of the plates in sixteenths of an inch,

P = the *mean* pitch of stay tubes from centre to centre.

For the wide water spaces between the nests of tubes the strength to be taken from

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch;}$$

where P = the horizontal distance from centre to centre of the bounding rows of tubes, and

C = 120 where the stay tubes are pitched with two plain tubes between them and are not fitted with nuts outside the plates,

C = 130 if they are fitted with nuts outside the plates,

C = 140 if each alternate tube is a stay tube not fitted with nuts,

C = 150 if they are fitted with nuts outside the plates,

C = 160 if every tube in these rows is a stay tube and not fitted with nuts,

C = 170 if every tube in these rows is a stay tube and each alternate stay tube is fitted with nuts outside the plates.

The thickness of tube plates of Combustion Chambers in cases where the pressure on the top of the chambers is borne by these plates is not to be less than that given by the following rule :—

$$T = \frac{P \times W \times D}{1600 \times (D - d)}$$

where P = working pressure in lbs. per square inch,

W = width of Combustion Chamber over plates in inches,

D = horizontal pitch of tubes in inches,

d = inside diameter of plain tubes in inches,

T = thickness of tube plates in sixteenths of an inch.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L-P) \times D \times L} = \text{working pressure in lbs. per square inch;}$$

where L = width between tube plates, or tube plate and back plate of chamber,

P = pitch of stays in girders,

D = distance from centre to centre of girders,

d = depth of girder at centre,

T = thickness of girder at centre. All these dimensions to be taken in inches.

Wrought Iron.

$$C = \begin{cases} 6{,}000, \text{ if there is one stay to each girder.} \\ 9{,}000, \text{ if there are two or three stays to each girder.} \\ 10{,}000, \text{ if there are four or five stays to each girder.} \\ 10{,}500, \text{ if there are six or seven stays to each girder.} \\ 10{,}800, \text{ if there are eight stays or above to each girder.} \end{cases}$$

Wrought Steel.

$$C = \begin{cases} 6{,}600, \text{ if there is one stay to each girder.} \\ 9{,}900, \text{ if there are two or three stays to each girder.} \\ 11{,}000, \text{ if there are four or five stays to each girder.} \\ 11{,}550, \text{ if there are six or seven stays to each girder.} \\ 11{,}880, \text{ if there are eight stays or above to each girder.} \end{cases}$$

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89{,}600 \times T^2}{L \times D} = \text{working pressure in lbs. per square inch.}$$

where T = thickness of plates in inches,

D = outside diameter of furnace in inches,

L = length of furnace in feet. If strengthening rings are fitted, the length between the rings is to be taken.

If the plates do not exceed $\frac{9}{16}$ in. in thickness, the pressure, however, is not to exceed

$$\frac{8{,}000 \times T}{D} = \text{lbs. per square inch.}$$

If the plates are of steel and exceed $\frac{9}{16}$ in. in thickness, the pressure is not to exceed

$$\frac{8{,}800 \times T}{D} = \text{lbs. per square inch.}$$

If the furnaces are each fitted with a single Adamson ring at about the middle of their length, the pressure may be calculated from

$$\frac{10{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are each fitted with two Adamson rings, then the pressure may be calculated from

$$\frac{11{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are each fitted with a series of Adamson rings at intervals not exceeding 23 inches, the pressure may be calculated from

$$\frac{1{,}000 \times (T-2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness in sixteenths of an inch,

D = outside diameter of furnaces.

The strength of corrugated furnaces made of steel, having a less tensile strength than 26 tons per square inch, the corrugations being 6 inches apart and $1\frac{1}{2}$ inches deep, to be calculated from

$$\frac{1{,}000 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of furnaces made of steel, having a tensile strength between 26 and 30 tons per square inch, and corrugated on Fox's or Morison's plans, to be calculated from

$$\frac{1{,}259 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of ribbed furnaces (with ribs 9 inches apart) to be calculated from the following formula :—

$$\frac{1{,}160 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch,}$$

The strength of spirally corrugated furnaces to be calculated from the following formula :—

$$\frac{912 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plates in sixteenths of an inch,

D = outside diameter of corrugated furnaces, or outside diameter of the plain part of ribbed furnaces in inches.

The strength of Holmes' Patent Furnaces, in which the corrugations are not more than 16 inches apart and two inches high, to be calculated from the following formula :—

$$\text{Working pressure in lbs. per square inch} = \frac{945 \times (T - 2)}{D}$$

where T = thickness of plain portions of furnace in sixteenths of an inch,

D = outside diameter of plain parts of the furnace in inches.

DONKEY BOILERS

The iron used in the construction of the fire boxes, uptakes, and watertubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any cases where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULES FOR DETERMINING SIZES OF SHAFTS.

46. The diameters of crank and straight shafts are to be not less than those given by the following formula :—

For Compound Engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 04\,A + \cdot 006\,D + \cdot 02\,S) \times \sqrt[3]{P}$$

For Triple expansion engines with three cranks at equal angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 038\,A + \cdot 009\,B + \cdot 002\,D + \cdot 0165\,S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 034\,A + \cdot 011\,B + \cdot 004\,C + \cdot 0014\,D + \cdot 016\,S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with three cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot 028\,A + \cdot 014\,B + \cdot 006\,C + \cdot 0017\,D + \cdot 015\,S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with four cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot 033\,A + \cdot 01\,B + \cdot 004\,C + \cdot 0013\,D + \cdot 0155\,S) \times \sqrt[3]{P}$$

where A = diameter of High Pressure Cylinder in inches,
B = diameter of first Intermediate Cylinder in inches,
C = diameter of second Intermediate Cylinder in inches,
D = diameter of Low Pressure Cylinder in inches,
S = Stroke of Pistons in inches,
P = Boiler pressure above atmosphere in lbs. per square inch.

The Screw shaft to be the same diameter as is required for the crank shaft.

Intermediate shafting should be at least $\frac{2}{10}$th of the diameter required for the crank shaft.

NOTE.—The Rules are intended to apply to Two Cylinder Compound Engines, in which the ratio of areas of Low and High Pressure Cylinders does not exceed 4·5 to 1 ; to Triple Expansion Engines in which it does not exceed 9 to 1 ; to Quadruple Expansion Engines in which it does not exceed 12 to 1 ; and in all cases, as regards the stroke, in which the length of stroke is not less than one half the diameter or greater than the diameter of the Low Pressure Cylinder. Engines of extreme proportions beyond these limits being specially submitted to be dealt with on their merits.

PERIODICAL SURVEYS. (*See* N.B. at foot.)

47. The machinery and boilers of all steam ships are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey every four years, unless the machinery and boilers have been specially surveyed within a period of twelve months.

48. At these Special Surveys, and on other occasions if deemed necessary by the Surveyor, the propeller, stern-bush and fastenings of the sea connections are to be examined while the vessel is in dry dock, and, if deemed necessary by the Surveyor, the stern shaft is to be drawn and examined.

49. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

50. The sea connections and arrangements of cocks, pipes, bilge-suctions, roses, &c., are to be examined.

51. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

52. The safety valves are to be examined and set to the safe working pressure.

53. If satisfactory, these Surveys will be recorded in the Register Book thus:—"LMC9,91" *in red;* or "B&MS9,91" *in red.*

54. "LMC" (LLOYD'S MACHINERY CERTIFICATE), with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

55. "B&MS" (BOILERS AND MACHINERY SURVEYED), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

56. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

57. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

58. At these surveys the boilers and superheaters are to be examined internally and externally, and, if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

59. The safety valves are to be examined and set to the safe working pressure.

60. If satisfactory, these surveys will be recorded in the Register-Book thus: "BS9,91" *in red.*

61. "BS" (BOILERS SURVEYED), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

62. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

63. In steam vessels, the engines and boilers are to be considered as part of the equipment. (*See* Section 76.)

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE, No. 438.*

BOILERS MADE OF STEEL.

NOTICE is hereby given, that the Committee of this Society have this day passed the following resolutions amending Notice No. 397 in regard to boilers made of steel:—

1. The use of steel will be sanctioned in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, provided the boilers be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled.

2. The material is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section,* with an ultimate elongation of not less than 20 per cent. in a length of eight inches. It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82° Fahrenheit.

Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented.† In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the furnaces and combustion chambers of the boilers.

4. The Society's Surveyor will attend at the steel works when necessary, and select the samples for testing before the plates are sheared to size, and these samples when marked by him for testing should, as far as practicable, be followed by the Surveyor through the different stages of preparation until the tests are completed.

5. The Society's Surveyor will require to have every facility placed in his way for tracing all plates to their respective charges, and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the tests applied to the material, is to be signed and forwarded to the boiler manufacturer, and the other is to be retained by himself.

6. The samples are taken for testing in order that the general quality of the material may be ascertained, and if any sample should fail to fulfil the conditions laid down, the plate from which the sample is taken must be rejected; and further tests should be made before any material, made from the same cast or charge as the failing sample, can be approved.

7. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

† When a great number of charges are represented in the number of plates submitted, a proportion of one tensile and one temper test to every ten plates will be deemed sufficient, provided they all prove to be satisfactory.

No. 438* (*continued*).

8. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

9. No steel stays are to be welded.

10. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.
19th May, 1881.

HULL.

Section 79. The Surveyors are directed to examine and report the scantling of timbers, plank and fastenings, and to state where built, and by whom, in the same manner as directed for sailing vessels.

Section 80. The Surveyors are required to report the number, size, length, fastenings, and mode of arrangement of the engine and boiler *sleepers*, and the description of timber of which they are composed, and whether diagonally trussed with wood or iron, and to what extent; the length, size, and fastenings of shelf-pieces and paddle-beams; and whether the vessel is constructed with sponsons, and how they are formed; and to give the length and shifting of the planks outside and inside.

EQUIPMENT.

Section 81. 1. The Surveyors are to examine and report the number and description of the masts, spars, sails, anchors, cables, hawsers, warps, and boats, as directed to be done for sailing vessels. For weight of anchors, size and length of chains, see Table No. 22 and Section 32, also Sections 72 to 76.

BOATS.

Section 82. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels. (*See* Section 75.)

WOOD VESSELS.

Exhibiting the Number of Years to be assigned to the different quality, properly seasoned,

	DESCRIPTION OF TIMBER.	TIMBERING.				
		Floors.	First Foothooks.	Second Foothooks.	Third Foothooks and Top Timbers.	Main and Rider Keelsons.
1	East-India Teak	16	16	16	16	16
2	English, African, and Live Oak, Adriatic, Italian, Spanish, Portuguese, and French Oak; Morung Saul, Greenheart, Morra, Iron Bark, and White Iron Bark	12	12	12	12	12
3	Cuba Sabicu, Pencil Cedar, Angelly, Vanatica, Jarrah Timber, Karri, Blue Gum, Red Gum, Box, Thingam, Puhutukawa, Molave, Dungon, Yacal, Mangachapuy, Betis, Ipil, Guijo, Narra, Batitinan, and Palomaria de Playa	10	10	10	10	10
4	Second-hand English, African, and Live Oak, Adriatic, Italian, Spanish, Portuguese, and French Oak; East-India Teak, Morung Saul, Greenheart, Morra, and Iron Bark (*e*)	8	8	7	7	7
5	Stringy Bark, and Red Cedar, Banaba and Philippine Islands Cedar	8	8	7	7	8
6	Danish Oak, other Continental White Oak, Mahogany of *Hard Texture*, Spanish Chestnut, Flooded Gum, Spotted Gum, Grey Gum, Turpentine, Black Butt, Tulip-wood, Tallow-wood, and Mulberry	*9	*9	9	9	*9
7	North American *White* Oak	*8	8	8	8	8
8	Pitch Pine, Oregon Pine, Huon Pine, Cowdie or Kaurie Pine, Larch, Hackmatack, Tamarac, and Juniper	*9	*9	9	9	*9
9	Dantzic, Memel, Riga, and American Red Pine	*8	*8	8	8	*8
10	English Ash	*8	*6	*5	*5	*5
11	Foreign Ash and Rock Maple	*8	—	—	—	—
12	American Rock Elm and Hickory	*7 (*f*)	*6	6	6	*7
13	European and American Grey Elm	*6	*6	6	6	6
14	Black Birch and Black Walnut	*7 (*f*)	*6 (*f*)	—	—	—
15	Spruce Fir, Swedish and Norway Red Pine, and Scotch Fir	*8	*8	8	8	8
16	Beech	*7 (*f*)	*6	—	—	—
17	Yellow Pine	—	—	—	*4	*4

(*a*) This Table applies as to the Deadwood so far as regards the Materials to be used from the height of two feet above the rabbet of the Keel.

(*b*) American Rock Elm allowed for Limber Strakes, Bilge Strakes, and Ceiling between them in Ships of the 9 years' grade, and under.

(*c*) Yellow Pine allowed for Waterways of Upper Deck in Ships of the 8 years' grade, and under, if properly fastened as prescribed in Table B, and provided the Beams are well secured independently of the Waterways.

(*d*) The Materials marked thus *d* under the head of "Rudder and Windlass," allowed in Ships of 300 Tons and under only.

(*e*) In cases where second-hand Timber of the description named in line No. 4 is proposed to be used, application may be made to the Committee, who will appoint a special survey to be held thereon; and on a Report being received of its being of superior quality and of adequate size, a higher grade (not exceeding two years) may be allowed than as above set forth.

(*f*) Black Birch, Beech, and American Rock Elm allowed for Floors amidships to an extent not exceeding three-fifths the entire length of the Keel in Ships of the 9 years' grade and under.

Black Birch allowed for First Futtocks amidships to the same extent in Ships of the 8 years' grade.

descriptions of Timber used in Ships, the same to be of good and free from defects.

TIMBERING.				OUTSIDE PLANK, &c.				INSIDE PLANK, &c.	
Transoms, Knightheads, Hawse-Timbers, Apron, and Deadw'd *(a)* Stem and Stern Post.	Beams and Hooks.	Knees.	Pall Bitt, Windlass, and Main Piece of Rudder.	From top of Keel to two-fifths the depth of Hold	From two-fifths the depth of Hold to Wales.	Wales, Black-Strakes, Topsides, and Sheerstrakes.	Upper deck Waterway, Spirketting, and Planksheers.	Shelves, Clamps, Limber and Bilge Strakes, Ceiling in hold and betwixt Decks, also Spirketting and Waterway below the Upper Deck.	
16	16	16	16	16	16	16	16	16	1
12	12	12	12	12	12	12	12	12	2
10	12	12	10	12	10	10	10	12	3
7	7	7	7	—	—	—	7	7	4
7	7	7	8	12	8	7	7	8	5
9	*9	*9	*9	*12	10	10	10	*10	6
8	8	*7	*9	*12	*8	8	8	8	7
9	*9	*9	*9 *(d)*	*12	10	10	*10	10	8
8	*8	*8	*6 *(d)*	*9	9	9	*10	9	9
*4	*5	*5	*5 *(d)*	*10	5	—	—	—	10
—	—	—	—	*8	6	—	—	*5	11
6	*7	6	*7	*12	7	6	6	7 *(b)*	12
6	6	6	—	*12	6	—	—	—	13
—	—	—	*6 *(d)*	*10	6	6	—	—	14
8	8	*8	—	*8	8	8	8	8	15
—	—	—	*6 *(d)*	*12	6	—	—	—	16
*4	*4	*4	—	*6	*5	*5	*5 *(c)*	*5	17

MEM.—The word "English" includes Timber the growth of the United Kingdom.

☞ **SALTING.** *All* Ships built of the Timber above named, except those built wholly of Teak, will have one year added to their classification, if salted, provided it be done to the satisfaction of the Surveyors and as prescribed in Section 37 of the Rules; but Vessels built of the Materials contained in Lines 6 to 17 inclusive *must* be salted, or one year will be deducted from the term of years assigned on the Table, except where used for those parts indicated by an asterisk, thus: *

Lloyd's Register of Shipping, London, 19th December, 1889.

WOOD VESSELS.

TABLE E

Minimum Dimensions of TIMBERS, K

TONNAGE (*See Section 32*) .....TONS....	50	100	150	200	250	300	350	400	450	500	550
(*a*) TIMBER AND SPACE.....INCHES..	18	19	20	21½	23	24¼	25¾	27¼	28½	30	30¼
Floors, sided and moulded at Keelson, if squared	7	7½	8	8¾	9½	10¼	11	11¾	12¼	13	13¼
Double Floors, sided and moulded at Keelson, if squared.....	6	6½	7	7¾	8½	9¼	10	10½	11¼	12	12¼
(*b*) 1st Futtocks, sided and moulded at Floor-Heads, if squared	6	6½	7	7¾	8¼	8¾	9¼	10	10½	11	11¼
2nd Futtocks, sided, if squared	5½	6	6½	7	7½	8	8½	9	9½	10	10¼
3rd Futtocks and Long Top Timbers, sided, if squared.....	5½	5¾	6	6½	7	7¼	7¾	8¼	8½	9	9¼
Top Timbers (Short), sided, if squared.....	—	—	—	—	—	—	—	—	—	9	9¼
Top Timbers, moulded at heads, if squared	4	4½	4¾	5	5	5¼	5½	5¾	6	6	6¼
Breasthooks and Wing Transom, sided and moulded in the middle	8	8½	9	9¾	10¼	10¾	11¼	12	12½	13	13¼
(*c*) Keel, Stem, Apron, and Sternpost, sided and moulded	8	9	10	10¾	11¼	11¾	12¼	13	13½	14	14¼
Keelson, also the Mainpiece of Rudder from lower part of Counter upwards, sided and moulded	9	10	11	11¾	12¼	12¾	13¼	14	14½	15	15¼
(*d*) Wales	3	3½	4	4¼	4¼	4½	4¾	4¾	5	5	5
(*e*) Bottom Plank, from Keel to Wales	2	2¼	2½	2¾	3	3¼	3½	3¾	3¾	4	4
Sheer Strks, Topsides, Up. Dk. Clamp where there is no Shelf fitted, & Low. Dk. Clamp with a Shelf	2¼	2½	3	3¼	3½	3½	3¾	3¾	4	4	4
Ceiling below Hold Beam Clamp	1½	1¾	2	2¼	2½	2¾	2¾	2¾	3	3	3
(*f*) Waterway, { Hardwood.....	3½	4	4½	5	5	5½	5½	6	6	6½	6½
Fir	4	4½	5	5½	6	6½	6½	7	7½	8	8
Ceiling betwixt Decks	1½	1¾	2	2	2¼	2¼	2¼	2½	2½	2½	2½
Bilge Plank, inside, Thick Strakes over long and short Floorheads, and Limber Strake ..	2½	3	3½	3¾	3¾	4	4¼	4¼	4½	4½	4½
Lower Deck Clamp where there is no shelf fitted, and Spirketting	—	—	3	3¼	3½	3¾	4	4	4¼	4½	4½
Upper Deck Clamp where a Shelf is also fitted	2	2¼	2½	2½	2¾	2¾	2¾	2¾	3	3	3
Plank sheer	2	2¼	2½	2¾	3	3¼	3½	3¾	3¾	4	4
Flat of Upper Deck (*see note at side*)	2½	2½	2½	3	3	3	3	3	3	3½	3
Scarphs of Keelson without Rider	ft. in. 4 6	ft. in. 4 9	ft. in. 5 0	ft. in. 5 3	ft. in. 5 6	ft. in. 5 10	ft. in. 6 2	ft. in. 6 6	ft. in. 6 9	ft. in. 7 0	ft. 7
Ditto, where Rider Keelson is added, also Scarphs of Keel	4 0	4 3	4 6	4 9	5 0	5 2	5 4	5 6	5 9	6 0	6
Main Piece of Windlass (*see footnote*) INCHES..	12	14	14	15	15	15	16	16	17	17	1

For Moulding, see footnote.

Decks if of Teak may be reduced *one-sixth* in thickness.
Upper Decks must be renewed when worn in thickness as follows, viz.—When a deck originally 4 inches thick is worn to 3 inches; 3¼ inches to 2¾ inches; 3 inches to 2½ inches.

Mouldings of Futtocks and Top Timbers to diminish gradually from size given

(*a*) Should the timber and space be increased, the siding of the timbers to be increased in proportion. See RULES, sec. 39.

(*b*) When the heels of 1st Foothooks meet at the middle line on the Keel, under the Keelson, either with full moulding, or with Cross Chocks prope butted, the siding of single Floors, and their moulding at the Keelson, may be REDUCED to the siding and moulding allowed for Double Floors.

(*c*) The rabbet of the Keel, Stem, and Sternpost to be made so as to leave sufficient substance of wood to form a substantial back rabbet.

(*d*) For breadth of Wales required in every case, see SECTION 45.

(*e*) All the fore and after hoods, both outside and inside, may be reduced one-sixth in thickness. Furrens are not allowed in this or in any other p of a ship.

Lloyd's Register of Shipping, 25th May, 1871.

EELSON, KEEL, PLANKING, &c.

0	650	700	750	800	850	900	950	1050	1150	1250	1350	1500	1750	2000
½	31	31¼	31½	31¾	32¼	32½	32¾	33¼	33½	33½	33¾	34	34½	35
¼	13½	13½	13¾	13¾	14	14	14¼	14½	14¾	15	15¼	15¼	15½	15¾
¼	12½	12½	12¾	12¾	13	13	13¼	13½	13¾	14	14¼	14¼	14½	14¾
½	11¾	11¾	12	12¼	12¼	12½	12¾	13¼	13½	13¾	14¼	14¼	14½	14¾
½	10¾	10¾	11	11¼	11¼	11½	11¾	12¼	12½	12¾	13¼	13¼	13½	13¾
½	9¾	9¾	10	10¼	10¼	10½	10¾	11¼	11½	11¾	12¼	12¼	12½	12¾
¼	9¼	9½	9½	9½	9¾	9¾	10	10	10¼	10½	10¾	10¾	11	11¼
¼	6¼	6½	6¾	6¾	7	7	7¼	7¼	7½	7¾	8½	8½	8¾	9
¼	13½	13½	13¾	13¾	14	14	14¼	14½	14¾	15	15¼	15¼	15½	16
¼	14½	14½	14¾	14¾	15	15	15¼	15½	15¾	16	16¼	16½	16¾	17
¼	15½	15½	15¾	15¾	16	16	16¼	16½	16¾	17	17¼	17½	17¾	18
5	5¼	5¼	5¼	5½	5½	5½	5¾	6	6	6	6¼	6½	6¾	7
4	4	4	4	4¼	4¼	4¼	4¼	4½	4½	4½	4½	4½	4¾	5
4	4	4¼	4¼	4¼	4¼	4¼	4½	4½	4¾	4¾	5	5¼	5½	5½
¾	3¼	3¼	3¼	3½	3½	3½	3½	3¾	3¾	4	4	4¼	4½	4½
½	7	7	7	7	7½	7½	7½	7½	7½	8	8	8½	8½	9
8	8½	8½	8½	8½	9	9	9	9	9	9½	9½	9½	9½	10
½	2½	2¾	2¾	2¾	2¾	2¾	2¾	2¾	3	3	3	3¼	3½	3½
½	4½	4½	4¾	4¾	5	5	5¼	5½	5¾	6	6¼	6¼	6½	7
¾	4¾	4¾	4¾	4¾	5	5	5	5¼	5¼	5½	5½	5½	5¾	6
¼	3¼	3¼	3¼	3½	3½	3½	3½	3¾	3¾	4	4	4¼	4½	5
4	4	4	4	4	4	4	4	4	4	4	4	4¼	4½	5
½	3½	3½	3½	3½	3½	4	4	4	4	4	4	4	4	4
ft. in. 7 0	ft. in. 7 0	ft. in. 7 0	ft. in. 7 3	ft. in. 7 3	ft. in. 7 3	ft. in. 7 3	ft. in. 7 6	ft. in. 7 6	ft. in. 7 9	ft. in. 7 9	ft. in. 8 0	ft. in. 8 0	ft. in. 8 0	ft. in. 8 0
6 0	6 0	6 0	6 3	6 3	6 3	6 3	6 6	6 6	6 9	6 9	7 0	7 0	7 0	7 0
18	19	19	20	21	21	22	22	23	23	24	24	25	25	27

Floor Heads to that at Top Timber Heads. See RULES, sec. 38.

(f) This depth of Waterway for Faying Surface against Timbers is required, below the underside of the Plankshеer, to receive in and out through Bolts at alternate Timbers, with alternate through bolts in Shelf, and in Clamp where there is no Shelf.

MEM.—For relaxations in respect to Poops, Top-gallant Forecastles, and raised quarter decks, see RULES, sec. 38. For requirements for Vessels of excessive lengths as compared with breadth and depth, see RULES, secs. 39, 45, and 62.

WINDLASS.—The diameter of main piece of windlasses in Steam Ships may be 7/8 of that required in the Table, provided always the body of the windlass be not of unusual length.

(SEE OTHER SIDE.)

TABLE C.

SIDING & MOULDING OF BEAMS.—*Sec.* 41.

Length of Beam *amidships.*	HOLD BEAMS		DECK BEAMS	
	sided and moulded.	moulded at ends.	sided and moulded.	moulded at ends.
Ft.	In.	In.	In.	In.
10	—	—	4½	3¾
11	—	—	5	4
12	—	—	5¼	4¼
13	—	—	5½	4½
14	—	—	5¾	4¾
15	8	6¾	6¼	5¼
16	8½	7	6½	5½
17	8¾	7½	6¾	5½
18	9¼	7¾	7	5¾
19	9½	8	7¼	6
20	10	8½	7½	6¼
21	10¼	8¾	7¾	6½
22	10½	9	8	6½
23	11	9¼	8¼	6¾
24	11¼	9½	8½	7
25	11¾	9¾	8½	7¼
26	12	10	8¾	7¼
27	12¼	10¼	9	7½
28	12½	10½	9	7½
29	12¾	10¾	9¼	7¾
30	13	11	9½	8
31	13¼	11¼	9½	8
32	13½	11½	9¾	8¼
33	13¾	11½	10	8¼
34	14	11¾	10	8½
35	14¼	12	10¼	8½
36	14½	12¼	10¼	8½
37	14¾	12½	10½	8¾
38	15	12½	10½	8¾
39	15¼	12¾	10½	9
40	15½	13	10¾	9

N.B.—The size of Orlop Beams to be the mean of the sizes here prescribed.

The siding and moulding of ALL the Beams to be the same as those amidships, except those at the AFTER END of the Ship, which may be reduced in proportion to their diminished length.

MEM.—When SPRUCE, WHITE CEDAR or YELLOW PINE is used for Beams, the dimensions are to be increased.—See RULES, sec. 40.

SUGGESTED TABLE, B 2.

FOR THE THICKNESS OF INSIDE PLANK, &c., IN THE CONSTRUCTION OF SHIPS BUILT IN THE BRITISH NORTH AMERICAN COLONIES AND ALL FIR SHIPS WHEREVER BUILT.

TONNAGE - Tons	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1050	1150	1250	1350	1500	1750	2000
Thick Waterway. Inches	5	5¼	5½	6	6	6½	7	7½	7½	8	8	8½	8½	9	9	9½	9½	10	10½	11	11½	12	12½	13	13½	14
Spirketting	—	—	3	3¼	3½	3¾	4	4	4¼	4½	4½	4¾	4¾	4¾	5	5	5¼	5½	5¾	5¾	6	6¼	6½	6¾	6¾	7
Ceiling Below Hold Beam Clamp and between Decks. .	2	2	2¼	2½	2¾	3	3¼	3½	3½	3¾	3¾	4	4	4¼	4¼	4½	4½	4¾	5	5	5¼	5½	5¾	5¾	6	6
Bilge Plank (Inside) . .	2½	3	3½	3¾	4	4¼	4½	4¾	5	5½	6	6½	7	7	7½	8	8½	9	9½	10½	11½	12	12½	13	13½	14
Thickstuff over long and short Floor-heads and Limber Strakes	2½	2¾	3	3¼	3¼	3½	3¾	4	4¼	4½	4¾	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	7½	7¾	8	8¼	8½
Main Keelson (Rider Keelsons may be two-thirds that of main ditto.)	9	10	11	11¾	12¼	12¾	13¾	14	14½	15	15¼	15½	15½	15½	15¾	15¾	16	16	16¼	16½	16¾	17	17¼	17½	17¾	18

2, *White Lion Court, Cornhill.*

25th May, 1871

WOOD VESSELS.

TABLE D.

Sizes of BOLTS, PINTLES OF RUDDER,

TONNAGE *(see Section 32)*	50	100
Heel-Knee, Stemson, and Deadwood Bolts ..... Inches	$\frac{14}{16}$	$\frac{15}{16}$
Bolts in Sister Keelsons, Scarphs of Keel (*a*), Arms of Breast Hooks, Pointers, Crutches, Riders, Hanging and Lodging Knees to Hold or Lower Deck Beams (except in and out Throat Bolts of Hanging Knees, which must be larger), also in and out Bolts of Shelf, Clamp, and Waterway of Hold or Lower Deck Beams, and the in and out Throat Bolts of Upper Deck Hanging Knees.	$\frac{11}{16}$	$\frac{12}{16}$
Keelson Bolts (one through Keel at each Floor), Throats of Transoms, Throats of Breasthooks, and Throats of Hanging Knees to Hold or Lower Deck Beams	$\frac{12}{16}$	$\frac{13}{16}$
Bilge, Limber Strake, and Through Butt Bolts	$\frac{9}{16}$	$\frac{10}{16}$
Other Butt Bolts	$\frac{9}{16}$	$\frac{10}{16}$
Bolts through heels of cant timbers at fore and after Deadwood. In and out bolts of Upper Deck Waterway, Shelf and Clamp, also Arms of Hanging and Lodging Knees, except in and out Throat Bolts of Hanging Knees, which must be larger.....	$\frac{10}{16}$	$\frac{11}{16}$
Pintles of Rudder { The Lower Brace must extend so as to receive not less than Two Bolts on the Planking on each side.....	$1\frac{7}{8}$	2
Hardwood Treenails.....	1	1

(*a*) NUMBER OF BOLTS IN SCARPHS OF KEEL :—

In Ships of 150 Tons and under.....	6 Bolts	These Bolts to be of Copper or Yellow Metal in all cases.
" above 150 Tons and under 500 Tons ..	7 do.	
" 500 Tons and above.....	8 do.	

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25th May, 1871.

ND TREENAILS. *Section* 46.

50	200	250	300	350	400	450	500	700	900	1350
1	1	$1\frac{1}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{5}{16}$	$1\frac{6}{16}$	$1\frac{8}{16}$
$\frac{12}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	1	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$
$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	1	1	$1\frac{1}{16}$	$1\frac{2}{16}$	$1\frac{2}{16}$	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{6}{16}$
$\frac{10}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	1
$\frac{10}{16}$	$\frac{10}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$
$\frac{11}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	1	$1\frac{2}{16}$
2	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	3	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$
1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{1}{2}$

N.B.—Bolts to be through and clenched, as prescribed in *Section* 46, and to be of good quality, well made with suitable heads and be tightly driven.

TABLE **E.**

NUMBER OF HANGING KNEES.

Section 41.

Tons.	To Hold Beams.	To Upper Deck Beams.
	PAIRS.	PAIRS.
150	—	4
200	4	6
250	5	7
300	6	8
350	7	9
400	8	10
450	8	11
500	9	12
550	9	13
600	10	14
650	10	15
700	11	16
750	11	17
800	12	18
900	13	20
1000	14	22
1100	15	24
1350	17	26

WOOD VESSELS.

Minimum Dimensions of IRON KNEE AND KNEE RIDERS FOR

TONNAGE (*see Section 32*) .....Tons	150	200	250	300	350	400	450	500	550	600	650
Number of Hanging Knees to Hold or Lower Deck Beams .....Pairs	3 (*a*)	4	6	8	9	Upwards, one Knee Rider to every					
Number of Hanging Knees to Upper and Middle Deck Beams .....Pairs	4	6	7	8	9	10	11	12	13	14	15
Breadth of Knees and Riders to Hold or Lower Deck Beams .....Inches	3	3	3	3	3	3	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$
Breadth of Upper Deck Knees, where there are two Decks, and of Middle Deck Knees, where there are three Decks .....Inches	3	3	3	3	3	3	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$
Thickness of Riders at the joints or butts of the Timbers .....Inches	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$	2	2	2
Thickness of Knees to Lower Deck or Hold Beams and Knee Riders at the Angle of the Throat .....Inches	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{3}{4}$	3	3	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$
Thickness of Knees to Lower Deck or Hold Beams and Knee Riders at the Throat Bolts.....Inches	$1\frac{3}{4}$	$1\frac{3}{4}$	2	2	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{3}{4}$	2
Thickness of Knees to Upper or Middle Deck at the Throat Bolts .....Inches (*b*)	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$	2	2	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	2
Thickness of Hanging Knees (not Riders) at the ends .....Inches	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	
Length of Beam Arms of Knees and Knee Riders for Lower Deck or Hold Beams... (*c*)	ft. in. 2 6	ft. in. 2 6	ft. in. 2 9	ft. in. 2 9	ft. in. 3 0	ft. in. 3 0	ft. in. 3 3	ft. in. 3 3	ft. in. 3 3	ft. in. 3 6	ft. in.

NOTE.—The Bolts in all Iron Riders in Hold, to be not more than twenty-one inches apart on the average. Standards upon the Beams of such Ships are not admitted as substitutes for Hanging Knees below them.

For sizes of Bolts, see Table D.

(*a*) Provided the depth of hold be 13ft. or upwards.

Lloyd's Register of Shipping,
7th March, 1878.

TABLE F.

BRITISH NORTH AMERICAN BUILT SHIPS AND FIR SHIPS. *Section* 62.

700	750	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Beam,	or Knees and		Riders	as per	Section 62.									
16	17	18	Upwards, one to every Beam											
$3\frac{3}{4}$	4	4	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{3}{4}$	5	5	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{2}$
$3\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{3}{4}$	4	4	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{3}{4}$
$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{3}{4}$	3	3	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{3}{4}$
$3\frac{3}{4}$	4	4	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{3}{4}$	5	5	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{2}$
$2\frac{3}{4}$	3	3	3	3	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{3}{4}$
$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	3	3	3	3	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
3 6	3 9	3 9	3 9	3 9	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0

(*b*) Breadth and thickness of Knees for Upper Deck, where there are Three Decks, may be one sixth less.

(*c*) Beam Arms of Upper and Middle Deck Knees, may be three inches shorter than those of the Lower Deck.

Side Arms of Hanging Knees not to be less in length, than one and a half the length of their Beam Arms. "*Jumped Knees*" will not be allowed.

Beam Arms of Knees and Knee Riders, which are 3ft. 6in. in length, to have not less than Four Bolts; and shorter than that length, to have not less than Three Bolts.

Side Arms of all Hanging Knees to have at least One Bolt more than in the Beam Arms.

LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

SUGGESTIONS FOR COMPOSITE VESSELS.

1894—95.

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SUGGESTIONS

FOR THE

CONSTRUCTION AND CLASSIFICATION OF COMPOSITE SHIPS.

All vessels constructed with iron frames, or part iron and wood frames, and wood planking, to be classed A for a term of years,* according to the timber material used in their construction, as set forth in Table I, provided the workmanship be well executed, subject to the surveys and conditions hereinafter stated.†

VESSELS BUILT UNDER A ROOF.

An additional year will be allowed to vessels built under a substantial and efficient roof, kept in good repair, and which extends on each side beyond the vessel's breadth, and beyond each of her ends to an extent equal to half her midship breadth.

COPPER OR YELLOW METAL BOLTS.

Paragraph No. 1. Two additional years will be allowed to vessels, whether planked with one or two thicknesses, if fastened with wrought copper or yellow metal bolts, from the lower part of keel up to the height of one-fifth of the midship depth of hold below the upper side of the upper deck and parallel thereto forward and aft, in one, two, or three-decked ships, and below the upper side of the main or tonnage deck in spar-decked ships, but the whole of the fastenings above this height may be of iron, if properly galvanized and dowelled or cemented over.

Such ships to be marked C. F. (*copper fastened*).

Paragraph No. 2. Three additional years will be allowed, provided the whole of the external fastening from the lower part of keel to the gunwale be of wrought copper or yellow metal bolts to the entire exclusion of iron.

Such ships to be marked **C. F.** (*copper fastened*).

IRON BOLTS AND GALVANIZED IRON BOLTS.

Vessels will be allowed to be fastened with galvanized or plain iron bolts, if efficiently dowelled or cemented over ; but the butt bolts, and also those which are used in fastening the fore hood ends before the

* The terms of years assigned to *Composite Ships* on the Character A will expire on the 31st December of the last year of the periods assigned to them.

† *Expunging or withdrawal of Character.—The fifth, sixth, and seventh Columns in the list of Steam Vessels, and the sixth, seventh, and eighth Columns in the list of Sailing Vessels, left blank, indicate that the Vessel has never been classed in the Register Book. Three dots ... in Column 7 in the list of Steam Vessels, and Column 8 in the list of Sailing Vessels, indicate that the vessel was at one time Classed by this Society, but that the Class has been withdrawn at owner's request. A black line with date under it in Column 5 in the list of Steamers, and Column 6 in the list of Sailing Vessels, indicates that, at that date, the Vessel,* from reported defects, *was not entitled to a Character in the Register Book. A red line with date under it in these Columns indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.*

iron stem plate, the after hood ends abaft the sternpost plate, extending from the keel up to the height of one-fifth the depth of hold below the upper side of the upper deck, in one, two or three-decked vessels, or below the upper side of the main or tonnage deck in spar-decked vessels, those which fasten the planking to the deadwood, the lower edge of the garboard strakes, and the wood keel, and stem scarphs, must be of wrought copper or yellow metal.

All vessels fastened with galvanized iron to be marked G.I.B. (*Galvanised Iron Bolts*), and with plain iron bolts (I.B.); and in addition all iron-fastened ships will be marked "*Expl. T. S.*" (*Experimental Triennial Survey*).

All vessels fastened with galvanized or plain iron bolts in the bottom, previous to being sheathed with copper or yellow metal, must be sheathed with wood not less than $1\frac{1}{4}$*in. thick, wrought hot on the best hair felt, and properly rabbeted into the stem, stern-post, keel, and into the planking at its upper edge; efficiently fastened to the bottom planks with yellow metal or copper nails, arranged to come between the frames, and be well caulked. The condition of the bolts and caulking of the bottom and planking to be ascertained at the periodical Surveys as per* Section 43. *The wood sheathing to be allowed to remain on the bottom as long as the bottom planks, bolts, and caulking prove satisfactory.*

SURVEYS WHILE BUILDING.

SPECIAL SURVEY.

Section 1. 1. The Surveyors are to examine the whole of the materials and the workmanship as it progresses, from the laying of the keel to the completion of the vessel, and to point out as early as possible anything that may be objectionable.

2. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

COMMON SURVEY.

Section 2. First.—Examination of the wood keel, stem, stern-post, deadwood, and frames before they are painted or coated.

Second.—Of all the beams, stringers, plates, &c., when in place, riveted-up ready to receive the planking.

Third.—When the vessel is planked outside, dubbed fair, and all the fastenings completed, but before she is either caulked, coated, or cemented, so that the inside and outside of the planking, and the bolts and their nuts, may be carefully examined.

Fourth.—When the vessel is caulked, but before the bolt-heads are cemented or have dowels fitted over them.

Fifth.—When the vessel is completed, launched, and equipped.

SUGGESTIONS AS TO THE BUILDING OF COMPOSITE SHIPS.

QUALITY OF IRON, MAKER'S NAME, AND WORKMANSHIP.

Section 3. 1. The whole of the iron to be of good malleable quality, to be capable of bearing a longitudinal strain of twenty tons per square inch, and all plate, beam, and angle iron, to be legibly stamped in not less than two places with the manufacturer's trade mark, or his name, and the place where made, which is also to be stated in the Report of Survey.

2. Any brittle or inferior iron, defective planking, timber, or other objectionable materials to be rejected.

3. The workmanship to be well executed, and submitted to the closest inspection before coating or painting.

RIVETS AND RIVETING.

Section 4. 1. The rivets to be of the best quality, and to be of the diameter as per Table H, the rivet holes to be regularly and equally spaced, and carefully punched opposite each other in the adjoining parts from the faying surfaces in the laps, lining pieces, butt-straps, and frames, and to be countersunk where required ; the rivets not to be nearer to the butts or edges of the plating, lining pieces to butts, or of any angle iron, than a space equal to their own diameter, and not to be farther apart from centre to centre than five times their diameter, or nearer than four times their diameter from centre to centre, and to be spaced through the frames and outside plating, and in reversed angle iron a distance equal to nine times their diameter from centre to centre.

2. All butts of iron plating, excepting those of poops and top-gallant forecastles, to be at least double riveted, and a space equal to twice the diameter of the rivets to be between each row ; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

SCANTLINGS.

Section 5. 1. The scantlings given in Table H are intended for ships the length of which, measured from the fore part of stem to the after part of the stern-post, on the range of the upper deck, does not exceed ten times their depth of hold, taken from the upper part of the floors to the top of the upper deck beams, or seven times their moulded breadth.

2. In vessels exceeding ten depths, or seven breadths in length, the builders are to submit their plans for giving them additional longitudinal strength to the Committee, through the Resident Surveyors, who are to express their opinions thereon.

3. The depth for defining the proportions of spar-decked vessels is to be measured from the top of the floor-plates to the upper side of the middle or tonnage deck beams. (*See* Section 24.)

WOOD KEEL.

Section 6. The wood keel to be of the dimensions set forth in Table H, to be free from all defects, the scarphs to be either vertical or horizontal, and to be tabled, the width of the tabling to be one-third the siding or moulding of the keel, as the case may be, and from $\frac{3}{4}$ of an inch to $1\frac{1}{4}$ inch deep, according to the size of the keel, and bolted with copper or yellow metal bolts, which are to be driven on and clenched on rings of the same metal ; the bolts are to be in size and number as required by Table K.

GARBOARD STRAKE.

Section 7. The garboard strakes not to be less than two-thirds the depth of keel prescribed in Table H, and properly rabbeted into it, to be fitted closely to the iron keel plate, and to be of sufficient width. The butts of the garboard strake to have not less than four feet six inches shift from the butts of the garboard strake on the opposite side of the vessel, nor less than the same shift clear of the keel scarphs. (For bolting, *see* Section 33.)

STEM AND STERN-POST.

Section 8. The stem and stern-post to be of the dimensions set forth in Table H, and of materials according to class as prescribed in Table I. Where necessary to scarph the stem, it must be a flat scarph, and its length not less than seven-tenths of that prescribed in Table K for keel scarphs, and tabled and bolted in the same manner. The hood ends to be well and efficiently rabbeted into the stem and sternpost.

APRON, INNER STERN-POST AND DEADWOOD.

Section 9. The apron, inner stern-post, and deadwood, to be of materials according to class as prescribed in Table I; the apron and inner sternpost to be of sufficient siding and moulding for the knight-heads and counter timbers respectively, to be secured to them, and to take the hood end fastenings.

SPACING OF IRON FRAMES.

Section 10. The spacing of the iron frames not to exceed 18 inches from moulding edge to moulding edge all fore and aft; a four feet length of angle iron, the size of the frame, is to be riveted to each floor and to the keel plate, back to back with the frame.

KEEL PLATE.

Section 11. The keel plate to be of the breadth and thickness prescribed in Table H, and to be made continuous up the apron and up the inner stern-post as high as practicable, but in all cases to extend above the lower deck or hold beam stringer angle iron. Forward and aft the plate is to be curved to the form of the bearding line, and to be one-sixteenth of an inch thicker than prescribed in the Table, where it passes over the deadwoods, apron, and inner stern-post; and to be sided as required by the form of the vessel, to have an angle iron of the size given in Table H for stringer angle irons riveted on each edge, flanged to the form of the vessel, to receive the plank fastenings. The keel plate to maintain its breadth for three-fifths the length of the keel in midships, and then to be gradually reduced until its edges conform with the flange of the angle iron on the keel plate forward and aft; the butts of the keel plates to be shifted clear of the keel scarphs.

FRAMES.

Section 12. The frames to be of the dimensions set forth in Table H, and the narrow flange to be of a parallel thickness, and the bolts are to be so placed that the nuts of the screw bolts may fit closely to the frames; the frames to be in as long lengths as possible, fitted and riveted on to the keel plate, and extended as near to the middle line as practicable, according to the plan of construction adopted, and in all cases to extend to the gunwale, and where raised quarter decks, poops, forecastles, and spar decks are constructed to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the curve; if the frames be welded, the welds to be perfect with not less than four feet shifts from the welds of next frames, or, if butted, to have not less than four feet shifts with four feet lengths of angle iron of the same size as the frames fitted back to back, riveted to them, and secured to the outside planking.

FLOOR-PLATES.

Section 13. 1. The floor plates to be in thickness according to Table H, but at each end of the vessel, for one quarter of her length, they may be reduced one-sixteenth of an inch where the midship

floor-plates are six-sixteenths and under ten-sixteenths of an inch, and two-sixteenths of an inch where the plates are ten-sixteenths and above in thickness.

2. The depth of the floor-plates at middle line to be regulated by the following rule, viz., to the vessel's depth, measured from the top of the keel to the top of the upper or spar deck beams amidships add the extreme breadth of the vessel, two-fifths of that sum in inches to be the depth of the floor-plates at the middle line well fore and aft, but at the extreme fore and after ends they must be deeper, so as to form an efficient connection between the two sides of the vessel.

3. The floor-plates are to extend up the bilges not less than to a perpendicular height of *twice* and *a half* the depth of floors amidships, from upper side of keel at middle line; and in no case to be less moulded in any part than a fair taper between the depth at middle line, and the moulding at their extreme ends, which is to be not less than the moulding of the frames. The ends of the floors to maintain the height prescribed amidships, for one quarter of the vessel's length; they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level, which place is to be determined by the form of the vessel, and from that point to the vessel's ends they are to be gradually increased in depth, so as to efficiently connect the sides of the vessel; the upper parts of the floors forward and aft are to be high enough to give ample room between the reverse frames on each side of the vessel for fitting the keelson angle irons.

4. In vessels having considerable rise of floor, the depth of the floor-plates on a square at the quarter of the vessel's extreme moulded breadth, set out from the middle line, is to be not less than three-fifths the depth of the floor-plate at the middle line, and the floor-plate is to be extended up the bilges by a fair taper from middle line, until it terminates at the moulding of the frames.

5. A floor-plate to be fitted and riveted to every frame and to be extended across the middle line, but, where a vertical centre plate is adopted at middle line, then the floor-plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames.

6. When floors extend from side to side, and are made in two lengths, the butts are to have double butt-straps, one on each side of the floor-plates, and three-fourths the thickness of the floor-plates, or else the floor-plates must be lapped and treble riveted.

WATERCOURSES.

Section 14. Watercourses are to be formed through all the floor-plates, on each side of the middle line, and at the bilges above the frames, so as to allow water to reach the pumps freely, and also through the vertical centre plate, and intercostal keelsons when such keelsons are adopted.

REVERSED FRAMES.

Section 15. Reversed angle irons on frames to be in size as per Table H. All vessels under 200 tons to have reversed angle iron riveted to every frame and floor-plate across the middle line, extended to the height of the upper part of the bilge, and to the gunwale on alternate frames, and to have double reversed angle irons in way of all keelsons and stringers in hold; and in addition all vessels of 200 tons and upwards to have reversed angle iron extended to the upper deck beam stringer on alternate frames, and, where raised quarter decks and spar decks are constructed, to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the

curve ; and on the remaining frames reversed angle irons are to be fitted to above the height of the lower deck or hold beam stringer angle iron if the vessel has two decks or tiers of beams, and to above the height of the middle deck beam stringer angle iron if the vessel has three decks or tiers of beams ; the rivets for securing the reversed angle iron to the frames and floor-plates to be in diameter as specified in Table H, and be spaced not to exceed a distance of nine times their own diameter from centre to centre ; butts of reversed angle iron to be secured with butt-straps.

MIDDLE LINE KEELSON.

Section 16. 1. The middle line keelson, if of single plate, and standing above the floor-plates, to be of the thickness prescribed in Table H, to be two-thirds of the depth of floor plates, and to have an angle iron, of the size given in Table H, fitted and riveted on *each* side, top and bottom, extending all fore and aft, the bottom angle irons to be riveted to a foundation plate the breadth of which is to be not less than three and a half times the flange of the angle iron fitted upon it, and the top angle irons to a rider plate on the top, the breadth of which is to be not less than the breadth of the flanges of the angle irons attached to them and the thickness of the keelson plates combined, to be properly shifted, and to be of the thickness given in Table H for box keelson plates, and the lower plates to be riveted to double reversed angle irons attached to each of the floors ; but the foundation plate may be dispensed with if the combined widths of the horizontal flanges of the bottom angle irons are equal to the breadth prescribed for the foundation plate, and double riveted to the angle irons on the floors.

BOX KEELSON.

2. If a box keelson be adopted it is to be formed of plates, properly shifted, of the thickness given in Table H, with a foundation plate, the depth of the box to be not less than two-thirds the depth of the floor-plates, and the breadth of it two thirds of its depth ; the lower angle irons of the box keelson to be of the size given for the frames, and the top ones the size of the reversed frames, and the keelson to be well stayed in way of the masts.

INTERCOSTAL KEELSON.

3. If an intercostal keelson be adopted, it is to be of the thickness prescribed in Table H, and riveted to vertical angle irons of not less size than the reversed frames attached to all floor-plates, the plates to extend from the keel plate to the top of the floors, a bulb plate of not less thickness than the lower deck beams, or other bars of equal strength, to be let down below the top of the floors sufficiently for the intercostal plates to be riveted to them ; in all cases these bars are to be fitted between two longitudinal angle irons on the floors, extending all fore and aft, of the size given for keelson angle iron in Table H, and riveted thereto. The intercostal plates to be fitted close to the floors, and to the flat keel plate.

VERTICAL CENTRE PLATE.

4. If the middle line keelson be formed of a vertical centre plate, extending from the keel plate to the top of the floors, it must be not less in thickness than that given in Table H, riveted to two fore and aft angle irons of the size given for stringer angle irons in Table H, attached to the keel plate. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to double vertical angle irons, of not less size than the reversed frames, riveted to their ends, and to the vertical centre plate, there is to be a flat keelson plate of the same breadth and thickness as to the keel plate, riveted to double reversed

angle irons on the upper edge of floors, and to two fore and aft angle irons of the size given for stringer angle irons in Table H, on the top edge of the vertical centre plate; but, should the vertical centre plate be extended above the upper edge of the floors, then it is to be riveted to two fore and aft angle irons of the size given in Table H, for stringer angle irons, and to *two* flat plates of the thickness given for box keelson plates, and half the breadth of the keel plates, one on each side of the middle line, which are to be well riveted to double reversed angle irons on the top of each floor, one of these reversed angle irons to reeve through the vertical centre plate, and in all cases the vertical centre plate to be extended to the stem and stern-post plates, and riveted thereto.

BILGE KEELSONS AND STRINGERS.

Section 17. 1. All vessels to have bilge keelsons fitted and riveted to double reversed angle irons to each floor, secured in an efficient manner, and to extend all fore and aft, and placed at the lower turn of the bilges according to the form of the bottom; to be formed of double angle irons of the size given in Table H, with bulb plate not less than the size given for hold beams fitted between them for one-half the length of the vessel in midships; and in addition, in vessels of 300 tons and under 700 tons, a stringer will be required between the bilge keelson and hold beams, formed of double angle irons back to back, well riveted to double reversed angle irons and to each other; at the fore and aft ends of the vessel the bilge keelson and stringer angle irons to be efficiently connected by plates forming hooks and crutches, which are to be properly riveted to the apron and inner stern-post plates; and such vessels to have intercostal plates fitted midway between the main and bilge keelsons, for three-fifths the vessel's length of keel in midships, these plates to be the thickness of the floor-plates, and connected thereto with angle irons of the size of the reversed frames.

2. In vessels of 700 tons and under 1,000 tons, in addition to the foregoing, a bulb plate, not less in thickness than the hold beams, is to be let down and riveted to the side intercostal plates, to be inserted between double angle irons on the top of the floors of the size given for stringer angle irons in Table H, and to be extended for three-fifths the length of the keel in midships, but the double angle irons to extend as far forward and aft as practicable.

3. In vessels of 1,000 tons and upwards, of a depth not requiring orlop beams, in addition to the foregoing, another stringer must be introduced formed of double angle irons fitted back to back to extend fore and aft, and riveted to double reversed angle irons and to each other; this stringer and the one below it are to be arranged so as to be equally spaced between the bilge keelson and hold beams, and a foundation plate, of the same thickness as the floors, is to be fitted for three-fifths the vessel's length of keel amidships under the bilge keelson, to be riveted to double reversed frames to the floors, and to which the bilge keelson is to be riveted. The breadth of the foundation plate is not to be less than three and a half times the flange of the angle iron fitted upon it.

4. Where bulb iron is used for keelsons or stringers, the joins to be overlapped and riveted; the length of the overlap must not be less than the depth of the bulb plate, but iron of other form than bulb may be used for them if of equal strength.

5. All angle irons for keelsons and stringers are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron or plate iron not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than the angle irons they connect.

SPACING OF BEAMS.

Section 18. 1. The spacing of the upper deck beams in no case to exceed 4 feet 6 inches from centre to centre.

2. Vessels of 11 feet depth of hold and under to have a stringer formed of double angle irons back to back, of the size given in Table H, placed midway between the bilge keelson and deck beams, fitted and riveted to reversed angle iron attached to each frame, to extend all fore and aft, and connected by plates at the ends forming hook and crutch, which are to be secured to the apron and inner stern-post.

3. Vessels over 11 and under 13 feet depth of hold to have a hold beam stringer plate of the same thickness as the upper deck stringer plate, but only two-thirds its breadth, efficiently secured to the side by an angle iron riveted to it and to the reversed frames, of the size given in Table H for stringer angle iron, to extend all fore and aft, and to be properly connected at the fore and after ends. Bracket or knee plates to be fitted and riveted to the stringers at alternate frames on the under side, and the inner edge of the stringer plate to be stiffened by an angle iron of the same size as given for the reversed angle iron on the frames; or, if preferred, a stringer may be formed of bulb plate of the size given for hold beams fitted between two stringer angle irons, passing all fore and aft, properly riveted to double reversed angle iron on the frames, and to each other, or a stringer may be introduced of any other form of equal strength.

4. Vessels of 13 feet and under 15 feet depth of hold to have a hold beam under every alternate upper deck beam.

5. Vessels of 15 feet depth of hold and under 18 feet to have hold or lower deck beams spaced not more than 4 feet 6 inches, and 9 feet from centre to centre alternately, and always to be placed under upper deck beams.

6. And, in vessels of 18 feet depth of hold and above, a hold or lower deck beam to be placed under every upper deck beam.

PANTING (TO PREVENT).

7. In vessels exceeding 12 feet in depth from the lower side of the lower deck beams, and having fine ends, extra beams will be required both forward and aft between the lower deck beams and floors to prevent "panting," the sizes, arrangement, and security of them to be to the satisfaction of the Surveyors.

TWO-DECKED VESSELS WITH ORLOP BEAMS.

8. All two-decked vessels exceeding 24 feet in depth from the top of the floors to the upper side of the upper deck beams, and three-decked vessels exceeding 24 feet to the upper side of the middle deck beams, and where the depth from the under side of the lower deck beams exceeds 15 feet, such vessels to have orlop beams under every second lower deck beam with a stringer plate on their ends, of the same breadth and thickness as the lower deck stringer, passing all fore and aft, supported by brackets riveted to every other frame between the beams; the orlop beams to be secured to lugs welded to the lower deck beam pillars; but, in the case of flush-deck ships, a depth of 25 feet will be allowed, provided the lower hold does not exceed 16 feet in depth from the under side of lower deck beams. Should a house be constructed on such flush-deck ship, for lodging crew or for store room, the same not to extend within 10 feet of the stern-post.

THREE-DECKED VESSELS.

9. In vessels having three decks, viz., upper, middle, and lower, and where cargo may be carried on the middle and lower decks, the beams, iron sheerstrake, upper deck stringers, and stringer angle irons and flat of upper deck are to bear the same proportion to the vessel's dimensions as in those having two decks, and the middle and lower deck beams, and stringers, are to be the same size, in proportion to the vessel's length and breadth, as they would be in the lower deck of a vessel having only two decks; but one-sixth reduction will be allowed in the thickness of the outside planking for one-fifth of the depth of hold below the upper deck stringer.

10. In all cases the middle deck is to be perfectly laid and caulked.

BEAMS.

Section 19. 1. Beams to be of bulb plate with double angle irons on the top edge, or of T bulb iron, or of any other approved form of equal strength.

2. The upper deck beams to be one quarter of an inch in depth to every foot in length of the midship beam, and to be in thickness one-sixteenth of an inch for every inch in depth, with one-sixteenth of an inch added; if of T bulb, the united breadth of the top flanges to be not less than three-fourths the depth of the beam, and where beams are formed of bulb plate with double angle irons on the top edge, the flanges of each of the angle irons are not to be less in their united breadth than three-fourths the depth of the beam, and to be one-sixteenth of an inch in thickness for every inch of the two sides of the angle iron.

MIDDLE-DECK, HOLD, AND ORLOP BEAMS.

3. Middle-deck, hold, and orlop beams to be one-eighth of the depth deeper, and one-sixteenth of an inch thicker than the upper deck beams.

4. All beams to be efficiently connected to the frames by bracket ends, or knee plates, the arms of each to be not less than twice and a half the depth of the beams in length, and of not less thickness than the beams.

PILLARS.

Section 20. All beams for at least three-quarters the length of the vessel in midships to be pillared, and in addition, the beams under the bowsprit, pall bitt, windlass, and capstan are to be pillared; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper deck, or spar deck, and to be of the sizes given in Table H.

ENGINE ROOM AND BOILER SPACE.

Section 21. In the construction of steam vessels, care must be taken that the engine and boiler bearers are properly constructed, and where they might interfere with the longitudinal strength of the vessel they must be extended a sufficient distance beyond the engine and boiler space to compensate for such interruption; and, after the machinery and boilers are fitted, as many hold or lower deck beams are to be introduced as may be practicable, and knee or bracket plates are to be added and riveted to the stringer plates and to alternate frames which have no beams in the said space, and the vessel is to be otherwise made secure where necessary in the engine room, to the satisfaction of the Surveyors.

RAISED QUARTER-DECKS.

Section 22. 1. The frames in all cases, and reversed angle iron on alternate frames, where practicable, are to extend to the raised quarter-deck stringer.

2. A reduction of one-half in the breadth and one fifth in the thickness will be allowed for the sheerstrake of the raised quarter-deck, and one-fifth in the scantlings of the beams, stringers, stringer angle iron, and flat of deck of raised quarter-deck, from that given in Table H for the upper deck of such ships; one-fifth reduction will also be allowed for the outside planking, or plating, of the raised quarter-deck from that given for topsides in Table H.

3. The upper deck beam stringer plate is to maintain its breadth to the break of the quarter-deck, and then it may be gradually reduced in breadth until it terminates at the sixth frame abaft the break, and the upper deck sheerstrake plate is to extend to the stern.

POOPS AND FORECASTLES.

Section 23. 1. In full poops and top-gallant forecastles, the frames are to be extended to their stringer plates; a reduction of one-fourth will be allowed from the dimensions required by Table H for the upper deck sheerstrake, stringer plate, angle iron on stringers, beams, and flat of deck; the same reduction will be allowed for the outside planking, or plating, of the poop or forecastle, from the thickness given for topsides in Table H; where plating alone is adopted it need not in any case exceed six-sixteenths of an inch in thickness, and may be single riveted. An iron or wood spirketting to be fitted and efficiently secured and caulked in the poop and forecastle, to prevent water from going into the 'tween decks. The united lengths of poop and forecastles not to exceed three-fifths of the entire length of the upper deck.

2. Where the poop or the forecastle is constructed of a rounded form at the gunwale, the frames need not extend beyond the lower part of the curve, and the beams may be of plain angle iron not less in dimensions than the size required in Table H for the main frames, one to be placed to every alternate frame, to scarph the main frames with not less than two-feet lengths and be properly riveted to them; the breast beams are not to be less in size than the angle iron for stringers prescribed in Table H, with an angle iron of the size of the reversed frames riveted to them, and the rounded gunwale when not intended to be planked over, its plating must be of the thickness required for sheerstrakes of poops; but, when intended to be planked over, the thickness prescribed for the stringer plates on beams of poops will be sufficient; in either case the plating must extend the breadth of the rounded form, and in such cases stringers on beam ends will not be required.

TONNAGE, HAVING REFERENCE TO SCANTLINGS, &c.

3. In flush-decked vessels having either one, two, or three decks (not being spar or awning decked) the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull and also the equipment of the vessel.

4. In vessels having a *raised quarter-deck*, or a poop, or top-gallant forecastle, or deck houses, or awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull; but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the*

addition of the tonnage of the space required for propelling power, is to regulate the equipment, and also the size of the main piece of rudder and windlass, and the keel and keelsons and their number, and the scantling of the stringer plates on the upper and lower deck beams, and the requirements as to double riveting.

5. But, in vessels where the tonnage of the erections above the tonnage deck is less than that required for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage cut on the main beam, for the tonnage that is to regulate the equipment and the size of the main piece of rudder and windlass, and the keel and keelsons and their number, the scantling of the stringer plates on the upper and lower deck beams, and the requirements for double riveting.

SPAR-DECKED VESSELS.

Section 24. 1. A spar-decked vessel is one having three decks or tiers of beams, where the space between the main and the spar deck is to be used only for the accommodation of crew and passengers, or to enclose the engine openings of steam vessels. The total depth of such vessels, measured from the top of floor-plates to the top of spar deck beams in midships, must not exceed thirteen-sixteenths, nor be less than twelve-sixteenths of the ship's extreme breadth. All frames and reverse angle irons on alternate frames are to extend to the spar deck stringer plate, except when constructed with a rounded form at the gunwale, then they may terminate at the lower part of the curve, but the reverse angle irons on the remaining frames are required to extend above the height of the main deck waterway or spirketting ; in such ships the gross tonnage below the main or tonnage deck is to regulate all scantlings below this deck, but the total tonnage is to regulate the scantlings of the keelsons and their number, the stringers in the hold, the size of the main piece of rudder, and windlass.

2. These vessels are to have a main or middle complete deck, perfectly laid and caulked, and a main or middle deck iron sheerstrake, each of the thickness prescribed by Table H, and the main deck stringer plate is to be fitted and connected to the iron sheerstrake by angle iron between the frames of the size given for stringers, and in addition an inner stringer angle iron passing continuously fore and aft must be riveted to the reversed frames and to the main deck stringer plate. The upper part of the sheerstrake is to be not less in height than the main deck waterway or spirketting, as the case may be, and the space between the waterway, or spirketting, and the sheerstrake, all fore and aft, is to be filled in and made water-tight.

3. In such vessels a reduction of one-fourth from the dimensions required by Table H for the corresponding parts in the range of the upper deck in ships with two decks will be allowed from the dimensions of all beams, stringers, thickness of deck, and the outside planking, or plating, from the main deck upwards. If plating alone be adopted between the main and spar decks, the thickness need not exceed six-sixteenths of an inch in any case, the butts to be *double* riveted, but the edges may be single riveted.

4. When the spar deck is constructed of a rounded form at the gunwale, the beams may be of plain angle iron, if fitted to alternate frames, not less in dimensions than the sizes required in Table H for the main frames, to scarph the main frames with not less than two-feet lengths, and be properly riveted to them. All hatchway and mast beams are to be of increased strength, and if of plain angle iron not to

be less than the sizes given for stringer angle irons in Table H, with other angle irons of the size of the reversed frames riveted to them back to back. The rounded gunwale to be plated and properly constructed to the satisfaction of the Surveyor.

5. Deck houses or other erections will be allowed on a spar deck, but only to the extent of one-tenth its total superficial area; they are not to exceed seven feet in height, nor be placed nearer to either end of the vessel than one-fifth of her extreme length.

6. Vessels to which the Rule applies as regards an entire spar deck, will be noted in the Register Book thus, "*Spar-deck.*"

IRON SHEERSTRAKE.

Section 25. 1. The iron sheerstrake to be one inch in breadth for every six feet of the vessel's length for half her length in midships, and to be of the thickness given in Table H; it may then be gradually reduced in breadth and in thickness to three-fourths of the midship breadth and thickness at her ends.

2. The butts of the iron sheerstrake in all cases to be shifted clear of the butts of the stringer plates on the beam ends, the shift in no case to be less than equal to three spaces of frames, and all plates where practicable to be not less than nine feet long, but if the sheerstrake plates are eighteen feet long they may be of two equal breadths, but carvel plated and single riveted; butts of all plating to be fitted quite close, and in no case is the lower edge of the iron sheerstrake to be fitted less than two-thirds of the breadth required by the Rule for sheerstrake, below the upper deck stringer plate. The butt-straps in all cases to be in one piece, whether fitted outside or inside, and in no case to be in two pieces by being cut at the stringer plate. (*See* Section 30.)

IRON BILGESTRAKE.

Section 26. The bilgestrake plates to be two-thirds the breadth of the iron sheerstrake, for three-fifths the length of the keel in midships, and from thence to the ends of the vessel they are to be reduced gradually to one-half their midship breadth; the thickness of the plates to be as prescribed in Table H, and they are to be fitted at the bilges with the middle of the plate at the height prescribed for floorheads, such position for the bilge plates to be maintained, notwithstanding that the floorheads may be carried higher. They are to be extended to the ends of the vessel in accordance with her form, and properly riveted to the frames.

DIAGONAL PLATES ON FRAMES.

Section 27. The diagonal plates on the frames to be not less than one-third the breadth of the iron sheerstrake, and fitted in pairs, transversely, all fore and aft, at an angle of 45°, with the butts of each pair meeting between the frames; to be of the thickness given in Table H, and connected to the sheer and bilgestrake plates by butt-straps, double riveted, and to be efficiently riveted to each other, and to each frame they cross.

STRINGER PLATES ON ENDS OF BEAMS.

Section 28. 1. All vessels to have stringer plates of the thickness given in Table H upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one, two, and three-decked vessels, to be in width one inch for every seven feet of the vessel's entire length, for half her length in midships and from thence to the ends of the vessel they may be gradually reduced to three-fourths the width

in midships ; in no case, however, is the width in midships to be less than eighteen inches. The stringer plates are to be riveted to the beams and properly shifted, fitted home, and riveted to the iron sheerstrake with an angle iron of the dimensions given in Table H, and the roughtree stanchions are not to pass through them. Stringer plates on the ends of beams below the upper deck may be reduced in width to three-fourths the midship breadth of the upper deck stringer, which breadth is to extend all fore and aft, and to have an angle iron of the dimensions given in Table H, extending all fore and aft, riveted to reverse angle iron on each frame and to the stringer plates.

2. In cases where a deck is not laid, and the width of the stringer plate on ends of hold beams is objected to, it may be reduced in width, provided such reduction be fully compensated for.

3. All stringer angle irons are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron, or plate iron, not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than that of the angle iron they cover.

GUTTER WATERWAYS.

4. Upper deck gutter waterways are to be flooded to ascertain if there be any leakage, and when completed they are to be properly cemented.

TIE-PLATES.

Section 29. 1. All vessels are to have tie-plates ranging all fore and aft upon each side of the hatchways on each tier of beams, and in addition thereto the beams of the upper and middle decks in three-decked or spar-decked vessels, and of the upper deck in vessels of one or two decks, must have tie-plates fitted from side to side diagonally, in number, one pair for about every thirty-five feet of the vessel's length ; these plates in both cases must not be less in width than once and a half the depth of the beams of their respective decks, and of the thickness required for stringer plates ; they are to be well riveted to each other and to the beams and stringers, and to have intermediate fastenings into the deck plank between the beams. In all cases their butts to be chain riveted.

2. Upon hold beams where a deck is not to be laid, a tie formed of double angle iron, of the size given for the main frames of the ship, may be fitted each side of the hatchways in lieu of tie-plates; but, if the beams are made of such additional strength laterally as not to require the support given by the said angle irons or tie-plates, double angle irons of the above size fitted at the centre line from opening to opening may be substituted.

HATCHWAYS AND MAST PARTNERS.

3. All hatchways and mast holes are to be properly framed to receive half beams where required, and the latter to have mast partners at each tier of beams (except at orlop beams), the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than three times the diameter of the masts; these plates are to be well riveted to each other, and to the beams, and angle iron carlings; and at the decks, where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and riveted to the plate round the mast holes. The mast holes, skylights and companions must be properly secured to the satisfaction of the Surveyors. Where wood coamings are fitted, plates are to be riveted to the beams to which the deck ends are to be fastened.

SKYLIGHTS.

4. The skylights to engine-rooms, and the coamings to which they are attached, are in all cases to be substantially constructed, and efficiently fastened to the beams, and whether of iron or wood, are not to be less than two feet six inches above the upper deck in one or two-decked vessels, and one foot six inches above spar or awning decks. The skylights to be securely attached to the coamings, and the glass in them should be very strong, from three-eights to half an inch thick, protected by a strong guard of iron rods or by a framework of wire; in addition, deadlights of either iron or wood should be fitted having bulls-eyes in them, and arrangements made for their efficient security in bad weather. Strong tarpaulin covers are in all cases to be provided. In spar-decked vessels, and those having either a poop, awning deck or bridge house, with the engine room beneath, the hatchways in the upper deck are to be enclosed by iron trunk bulkheads, not less than five-sixteenths of an inch thick, strengthened by angle iron and extended from the upper deck to the beams above, to which they are to be secured. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least eighteen inches above the upper deck, and arrangements made for their efficient security.

COAL BUNKERS.

5. Coal bunker pipes, where practicable, are to be formed so as to be at least six inches above the upper deck, fitted with gratings and lids, the latter to have studs to fit in openings made in the pipes for their security, the pipes to be so formed that tarpaulin may be securely lashed over them. Where it is necessary to fit flat cold bunker scuttle lids flush with the deck, they must be secured by a bar, or other approved fastening.

BUTT-STRAPS.

Section 30. Butt-straps in all cases, except those of floor-plates (*see* Section 13), to be one-sixteenth of an inch thicker than the plates they connect, and to be fitted with the fibre of the iron in the same direction as that of the plates, and riveted as per Section 4.

BUTT-PLATES OF OUTSIDE PLANKING.

Section 31. The plates to which the butts of the outside planking are to be secured must be of the breadth of the planks, extending from frame to frame, efficiently riveted thereto, and of the thickness given in Table H; but on the bows and quarters, or wherever else the plank ends may have a tendency to strain off, they are to be one-eighth of an inch thicker than therein prescribed.

PLANKING.

Section 32. 1. The material for planking to be in accordance with class in Table I, to be thoroughly seasoned, quite free from sap, wane, or other defects, to be wrought with the heart side to the frames, and with not less than three strakes between the butts, without step butting, and with not less than six-feet shifts; the garboard strakes to be shifted, and of the thickness given in Section 7; the bottom planking is not to be less in thickness than prescribed in Table H, from the garboard strakes up to within a fifth of the depth of hold set down below the upper deck stringer plate; from thence to the plank-sheer to be in thickness as prescribed in Table H for topsides; or, if preferred, the bottom planking may retain its thickness up to within a fourth of the depth of hold set down below the upper deck stringer plate, and from thence to the plankshеer be gradually diminished in thickness to that prescribed in Table H for topsides; the thickness of the wood sheerstrakes may be the thickness of the iron sheerstrake they cover less than that prescribed by Table H.

2. Outside planks (except the garboard strakes) are not to be more than twelve inches broad; they are to be fitted quite close to the frames and plates, and to each other at their inner edges, and wrought with proper seams outside in proportion to their thickness; the hood ends may be reduced one-fifth from the thickness given in Table H at the stem or stern-post, and one-third at the buttock. The caulking edge of the keel seam, and hood end seams of the planking at the stem and stern-post, need not exceed from two and a half inches to four inches in proportion to the tonnage of the vessel; which can be arranged by trimming the back rabbet from the bearding line to the rabbet line, as required, so as not to unnecessarily reduce the keel, stem, and stern-post. Furrens or pads are in no case to be used.

BOLTS.

Section 33. 1. The bolts to be not less than the sizes given in Table K; the garboard strakes to be cross-bolted from side to side, with bolts not exceeding four feet six inches apart.

2. The wood keel to have a vertical bolt through the keel plate between each frame. The stem, stern-post, deadwood, and remainder of the keel, to be through fastened in all cases, and the bolts spaced as in the keel.

3. The screw-pointed bolts for fastening the planking, when less than five inches thick, to be of such form under the heads as will prevent them from turning; their heads to be once and three-quarters the diameter of the bolts, and two-fifths their diameter in thickness; the nuts in all cases to be of the same description of metal as the bolts they are applied to, and to be in thickness equal to their diameter, and not to have less substance than three-eighths of the diameter of the bolts in any part, whatever the form may be, hexagon form being preferred.

4. All outside planks ten inches broad and above, to be double fastened; eight inches and a half and under ten inches, double and single fastened alternately; and under eight and a half inches single fastened; and all butts to be double fastened.

5. The bolt holes in the outside planking to be enlarged with a dowelling machine for the bolt heads, which in the bottom up to within one fifth the depth of hold set down below the upper deck stringer plate, are to be sunk within the surface of the planking one inch and a quarter, when dowels are intended to be used; from thence to the plankshear they need not be sunk more than three-quarters of an inch; the bolts to be properly driven with oakum and white lead, putty, marine glue, or other suitable composition under their heads, and in the bottom they are to be carefully covered (after the seams in the bottom are all caulked) with turned well-seasoned wood dowels, the fibre of which must be in the same direction as the planking, and be driven with white lead, marine glue, or any other approved composition. Where copper or yellow metal bolts are used, the sinking of them within the surface of the planking to be optional to the above extent.

PLANKING OF TWO THICKNESSES.

Section 34. 1. If the vessel is to be planked with two thicknesses, the whole of the inside thickness must be of material required by Table I, for the upper part of the vessel, and the outside thickness, if worked longitudinally, must be of the same material as is prescribed for a vessel constructed with a single thickness of planking, but if the outside thickness is to be worked diagonally, American Rock Elm may be used. If either or both thicknesses be worked longitudinally, or diagonally, each thickness need

only be one-half that prescribed in Table H, but thick garboard strakes will be required to be fitted and fastened as in the case of vessels with a single thickness of planking. When the outside thickness is worked diagonally, a longitudinal strake of plank must be rabbeted into the garboard strake, and the ends of the diagonal planks butted against it ; there must also be one or more longitudinal strakes of plank of the materials prescribed in Table I for the upper part of the vessel, fitted above the upper ends of the diagonal planking ; and, if the topsides be of a single thickness, the upper edge of the said longitudinal planking must be partly let into the topside plank or be rabbeted into a solid strake, so that it may be efficiently caulked. In all such cases both thicknesses must be caulked, and the outer thickness wrought hot on the *best hair felt*.

2. If both thicknesses of plank be worked diagonally, transversely to each other, from keel to gunwale, the bilge and diagonal planks may be dispensed with ; but, where the thicknesses are otherwise arranged, the bilge and diagonal plates must be fitted as in vessels with single thickness ; the diagonal plates may, however, be extended to ten feet apart on a square with three pairs crossing each other in the centre.

3. When the inner thickness of plank is wrought diagonally, all the planks must be double fastened to the frames, but, when wrought longitudinally, they may be fastened as per Section 33, the bolts in either case must be of the size prescribed in Table K. The outer thickness of plank must be secured to the inner by nut and screw bolts, or else by wrought copper bolts, driven through the inner thickness and clenched inside upon copper or yellow metal rings ; a reduction of one-fifth of the diameter from that prescribed in Table K will be allowed when nut and screw bolts are used for fastening the outer thickness of plank, and a reduction of one-third when it is intended to use wrought copper and to clench the bolts of this thickness.

4. In vessels claiming the additional period for copper or yellow metal bolts, the fastenings in both thicknesses must be of the description and to the height required in those having only one thickness. Where two thicknesses of planking are adopted, dowelling will not be allowed in either thickness.

5. When the planking is composed of two thicknesses, the outside thickness of planking should not exceed ten inches in breadth, and may be single fastened, but the fastenings are not to exceed twenty inches apart on an edge ; if, however, planks are used in the lower part of the bottom more than ten inches but not exceeding twelve inches in breadth, their fastenings are not to exceed eighteen inches apart on an edge.

6. All iron work, and all iron and wood surfaces which come in contact with each other, are to be properly coated with good paint, or other suitable composition.

CAULKING.

Section 35. 1. It is indispensable that the caulking should be well executed, and no material used, but the best brown oakum, with tarred spun yarn for the inner thread of bottom. The Surveyors are required to see the caulking thoroughly tested with a beetle and horse, especially in new vessels, and at all surveys when the sheathing is stripped off the bottom.

2. In vessels with two thicknesses of planking, the condition of the caulking of the outside thickness is to be ascertained, in new vessels, by having a few pieces cut out from the bottom planking so as to expose the oakum ; but it will not be necessary to have pieces cut out in vessels with single bottoms, as it can be ascertained whether the oakum is properly driven into the seams by inserting a thin knife into them from within the vessel.

KNIGHTHEADS, HAWSE TIMBERS, UPPER-DECK WATERWAYS, AND PLANKSHEER.

Section 36. 1. Where the knightheads, hawse timbers, upper-deck waterways, and plank-sheer are of wood, they must be of materials according to class in Table I, and fastened with bolts as in Table K.

2. The knightheads and hawse timbers are to be of sufficient siding and moulding, and to have boxing either outside or inside above the upper deck; they are to extend high enough for the efficient security of the bowsprit, and sufficiently below the upper deck to insure strength; to be well bolted, and connected by substantial hooks.

WATERWAYS.

3. Where the roughtree stanchions are of wood, the depth and moulding of the upper deck waterway must be sufficient to give them support; but the depth of the waterway is in no case to be less than three times the thickness of the upper deck, excepting where the plank-sheer covers it, and it will be required to be well bolted through the sheerstrakes or spirketting plate and upper deck stringer plate.

DECKS.

Section 37. 1. The flat of all decks to be of good quality, properly seasoned, free from sap and objectionable knots, the thickness and fastenings as per Table H.

DECK BOLTS.

2. The upper deck plank to be fastened by screw bolts from the upper side with nuts at the under side of the angle iron of the beams, and to the tie-plates (*see* Section 29). The bolts must be properly sunk with oakum and white lead under their heads, and be carefully covered over with turned dowels, with the fibre in the same direction as the deck plank, bedded in white lead, marine glue, or other suitable composition.

3. When the deck planks are six inches in width and under, single fastening will be sufficient; but, when they are above six inches and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding eight inches in width must be double fastened with nut and screw bolts.

4. If the deck is of teak, it may be one-eighth less in thickness than prescribed in Table H.

5. Upper decks must be renewed when worn in thickness as follows:—When a deck originally 4 inches thick is worn to 3 inches; $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches; 3 inches to $2\frac{1}{2}$ inches.

CEILING.

Section 38. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed, and from the upper part of the bilges upwards, either close ceiling or batten and space may be adopted, but the latter is considered preferable. It is recommended that the ceiling on the floors should be made in hatches, where practicable, of convenient sizes so as to be lifted when required for the purpose of survey, or for cleaning and painting. The thickness of the ceiling in the hold from the main keelson to the upper part of the bilges to be in accordance with Table H, and one-third less in thickness from thence upwards.

RUDDER.

Section 39. 1. The main piece of rudder to be of timber, according to class in Table I, of dimensions as per Table H, and the pintles as per Table K. In screw steamers, the size of the main piece of rudder must be increased in diameter not less than one-eighth above the dimensions given in Table H and the pintles and braces in the same proportion.

RUDDER BRACES.

2. The lower rudder brace is to extend on the bottom planking sufficiently to receive not less than three bolts before the hood ends in addition to the bolts in the stern-posts ; the remaining braces will not be required to pass the hood ends, but the ends of their arms should be made ⊣ shaped, or of other suitable form, so as to receive three through bolts in the stern-post.

CHAIN PLATE AND PREVENTER BOLTS.

Section 40. The chain plate and preventer bolts to be of the sizes given in Table K. When the chain and preventer plates are fitted on wood topsides, and the chain and preventer bolts are arranged to pass through below the iron sheerstrake, a plate is to be riveted to the frames, before working the wood topsides, of the same thickness as the sheerstrake, sufficiently wide to take the said bolts, and fillings of wood may be introduced between the frames for the bolts to pass through and be clenched upon plates, or otherwise secured to the satisfaction of the Surveyors.

CEMENT.

Section 41. All vessels to be efficiently cemented in the bottom, to the upper part of the bilge, care to be taken to have proper watercourses above the cement all fore and aft.

Section 42. 1. The Surveyors in their reports of vessels for original classification, which have partial deficiencies in either the workmanship, materials, or construction, are to state the same for the consideration of the Committee, when such vessels will be liable to have a reduced number of years assigned to them than they would otherwise have been entitled to.

2. *The Surveyors in submitting their reports of vessels not already classed, are in all cases, where practicable, to forward a sketch of the midship section, and other drawings where necessary, to be furnished by the builders, with figured dimensions of the component parts marked thereon.*

3. *Builders wishing to adopt plans other than those described herein, are to submit them in the usual manner through the Resident Surveyors (who are to state their opinions thereon) for the Committee's consideration and approval.*

PERIODICAL SURVEYS DURING CLASSIFICATION.

*PERIODICAL SURVEYS. (*See* N.B. at foot.)

Section 43. 1. All vessels to be surveyed annually if practicable ; and whenever the copper, yellow metal, wood, or other sheathing, is stripped off, the condition of the planking, fastenings, and caulking to be ascertained.

2. Vessels marked CF to be subject to a Special Survey every *four* years ; and those marked GIB

*In the cases of Steam Vessels, see Section 47, for Survey of Engines and Boilers.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

and IB, to be subject to a Special Survey every *three* years. Such Special Surveys will be noted in the Register Book.

3. When these Special Surveys are held, the vessel to be placed on blocks of a proper height in a dry dock, or upon ways; if she is sheathed with wood, a sufficient quantity must be removed for the examination of the bolts, caulking and planking.

4. At the first Special Survey the limber boards, and ceiling equal to one strake fore and aft on both sides in the hold, below the upper turn of bilge, must be removed.

5. At subsequent Special Surveys, ceiling equal to an additional strake on both sides in the hold, and one strake on both sides in the 'tween decks (provided it is close ceiled), must be removed; portions of the cement to be cut out to ascertain its condition, and that of the frames and keel plate; bolts of the bottom and keel, if of iron, to be got out for examination—the number removed, and their condition, to be stated in the Report of Survey. If the frames, floors, &c., are found to be much oxidized, the whole of the ceiling to be removed and the oxidation cut or beaten off, and the iron work, if necessary, renewed, and the whole then to be properly coated or painted.

6. At the second Special Survey the windlass to be unhung where necessary, and its wood lining sufficiently stripped for examination, and the chain cables ranged for inspection.

VESSELS NOT SURVEYED WHILE BUILDING

Section 44. 1. Vessels built in Great Britain, or the British North American Colonies, which have not been surveyed while building, will lose one year of the period to which they might otherwise have been entitled.

2. When a character is claimed for such a vessel, she must be placed on high blocks in a dry dock, or on a slip, or other convenient place, so that the keel and bottom may be seen and properly examined. The hold must be cleared, and proper stages made, the outside planking scraped bright from the light water-mark to the waterway seam, a sufficient number of fastenings removed from the keel, the planking of the flat of bottom, the bilges, between the light and load-line, and from the topsides, in order that their condition may be thoroughly ascertained.

3. Should the vessel be less than four years old from the date of launching, if close ceiled, a quantity of ceiling equal to one strake fore and aft on each side in the 'tween decks, a like quantity at the upper turn of bilge, and one plank at the lower turn of the bilge on each side over the floors in midships, will be required to be removed, and the limber boards lifted; but should the vessel exceed four years of age, unless she be found in a very clean and satisfactory condition, the whole of the ceiling, or such portion as the Surveyors may require, must be removed, excepting in the case of "batten and space ceiling."

WOODEN FLOORS, &c.

4. Should the vessel, however, have been constructed with wooden floors, or with iron and wooden frames, and with through fastenings, passing through the ceiling, and she be under four years of age, it will be sufficient if, in lieu of removing the ceiling as above described, a listing be cut out fore and aft on both sides in the 'tween decks 4 inches wide, a ceiling plank at the upper turn of the bilge and at the lower turn of bilge on each side over the floors to be taken out, and the limber boards lifted; but if she exceed four years of age, in addition to the above, a 4-inch listing must be extended fore and aft at the turn of the bilge on each side; and at other parts if considered necessary by the Surveyors.

5. When the foregoing preparations have been made, a careful survey must be held by two Surveyors (one of them to be an exclusive officer of the Society), who shall submit a report and midship section containing a full description of the vessel, comparing the same with the Rules.

6. Should a vessel submitted for classification be sheathed with wood or metal, the same will not be required to be stripped off (if all be found satisfactory to the Surveyors) beyond a sufficient quantity at the keel, hood ends, bilges, and between the light and load water lines, for the purpose of ascertaining the condition of the caulking and the fastenings.

CONTINUATION OF SHIPS ON THE A CHARACTER.*

Section 45. 1. If, on the expiration of the term of years originally assigned, or at any age of a vessel, the owner be desirous to have his ship remain or be replaced on the letter A, such continuation will be granted for a period not exceeding two-thirds the number of years assigned originally, provided that a Special Survey as hereafter described be held by two Surveyors, one of them to be an exclusive officer of the Society, and that all repairs found necessary be completed to their satisfaction. The number of years assigned on continuation to commence from the date of the completion of such repairs.

2. The ship must be placed in dry dock or laid on blocks upon ways, so that the keel and bottom may be examined.

3. All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.

4. The hold to be cleared, and proper stages made both inside and outside.

5. All the outside planking from the light water-mark upwards, including plankshеers and waterways, to be scraped or dubbed bright.

6. All the close ceiling, where the frames and floors are of iron, to be removed from the upper part of the bilges downwards, and, where close ceiling is fitted above this height, two strakes of ceiling are in addition to be removed between decks, and two strakes in the hold all fore and aft, when, should the condition of the frames and planking render it, in the opinion of the Surveyors, necessary, the whole of the close ceiling is to be removed.

7. The planking of one strake extending from amidships forward on one side, and from amidships aft on the other side, to be removed to expose the bilge plate, diagonal plates, and the backs of the frames.

8. Not less than twelve bolts on each side, whether of iron or yellow metal, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship; also cement to be removed in places, for the purpose of ascertaining the condition of the floors, frames, iron keel-plate, butt straps to outside planking, &c.

9. Where the middle line bolts are of iron, their condition is to be ascertained; but, if this be not practicable, additional intermediate bolts of copper or yellow metal must be driven through and clenched.

10. The windlass to be unhung, and its wood lining sufficiently stripped for examination.

11. The cables to be ranged, and the anchors and general equipment examined. The coal bunkers in steamers to be cleared, and all iron-work to be scraped clean.

12. The annual and special periodical surveys to apply to vessels so continued as required by Section 43 for ships on original class.

* Where composite vessels are not constructed in accordance with the Committee's printed suggestions, and deviation is required from a strict compliance with the Rules, special application must be made to the Committee.

EQUIPMENT.

Section 46. 1. The tonnage, as per Section 32 of Rules for Wood Ships, is to regulate the equipment. (*See* Sections 72 to 78 of the Rules for Wood Ships, also Table No. 22.)

2. The boilers and machinery are to be considered as part of the equipment, and, unless the Surveyors are satisfied of their efficiency, the Figure 1 will be withheld, and it is to be understood that, although, for facilities in contracting a class, to which the hull of a vessel may be found entitled, will be assigned, the class will not be inserted in the Register Book unless the engines and boilers have been surveyed in accordance with the requirements of the Rules.

DEFECTIVE EQUIPMENT.

3. In the case of a steam vessel already classed of which the engines or boilers are reported to be so far inefficient or defective as to imperil the vessel's safety, an indication to that effect will be made in the Register Book by a red ring being stamped or posted over the Figure 1 for equipment, and in the case of vessels about to be built, for which drawings are submitted for the approval of the Committee, and where the engines or boilers are of novel description, or where experience has not sufficiently shown the safety of the principle or mode of application involved, the Figure 1 will not be assigned, and the words—"Boiler Experimental," or "Machinery Experimental," will be placed against the class of the vessel in the Register Book, but where in the opinion of the Committee the machinery or boilers are deemed so far inefficient or defective as to imperil the vessel's safety, the Figure 1 will be withheld, and a red ring inserted in place thereof; and in the case of masts or rigging of a ship which are reported to be so far defective as to imperil the vessel's safety, the indication in the Register Book will be made by a black ring, stamped or posted over the Figure 1 for equipment; as described in the foot-note on the page of the Register Book, and in the Key thereto.

RULES FOR THE SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 47. 1. In steam vessels the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them, in the manner shown in form No. 8 annexed. If found satisfactory, the Committee will thereupon grant a certificate, and insert in the Register Book the notification, "LMC." *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

ORDINARY SURVEY OF NEW ENGINES OR BOILERS WILL BE AS FOLLOWS

2. On the different parts of the engines during erection.
3. On the sea connections while being fitted to the vessel.

4. On the boiler plates when they are bent, flanged and holed, ready for riveting, and on stays, &c., while being fitted.

5. Testing the boilers by hydraulic pressure.

6. When engines and boilers are being fixed on board the vessel.

7. At the setting and testing of safety valves and trying the machinery under steam.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

8. In steam vessels built under Special Survey, the machinery and boilers must also be constructed under Special Survey.

9. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠LMC," or "✠NE&B," or "✠NB."

10. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined, and from them the working pressure fixed.

11. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.

12. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

13. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 45.)

14. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

15. The boilers together with the machinery, to be inspected at different stages of construction.

16. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

17. Two safety valves to be fitted to each boiler and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60lb. per square inch, the safety-valves may be loaded to 5lbs. above the working pressure. If common valves are used, their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case is to exceed 10 per cent. of the working pressure.

18. An approved safety valve is also to be fitted to the super-heater.

19. In winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

20. Each valve is to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers, and to be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

21. Stop valves are to be fitted so that each boiler can be worked separately.

22. Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

23. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside planking.

24. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyors.

25. In cases where it is proposed to construct boilers of steel for classed vessels, or vessels intended for classification, the material is required to fulfil the following conditions (*see* Circular, No. 438*) :—

1. The material of stays and of plates is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.

   In all cases the ultimate elongation must not be less than 20 per cent. in a length of 8 inches.*

   It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82 degrees Fahrenheit.

2. Steel rivets are to be considered as part of the material, and, in addition to being subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented. In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the construction of boilers.

4. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

5. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

6. No steel stays are to be welded.

7. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

ENGINES.

26. The engines are to be fitted with two feed pumps, each capable of supplying the boilers ; the pumps, &c., are to be so arranged that either can be overhauled whilst the other is at work.

27. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

28. In engines of 70 H.P. and under, one feed pump and one bilge-pump will be deemed sufficient, provided they are of adequate capacity.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators for controlling their speed. If only one such pump is fitted for the main feed, the auxiliary feed pump required by paragraph 31 should also be fitted with an automatic speed regulator.

29. A bilge injection or a bilge suction to the circulating pump is to be fitted.

30. The engine bilge pumps are to be fitted capable of pumping from each compartment of the vessel. (*See* Section 38). The mud boxes and roses in engine-room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

31. A steam pump is to be provided capable of supplying the boilers with water; this pump to be provided with suctions to the hotwell and also to the sea. A steam pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine-room, it must be fitted to be worked by hand. In small vessels in which only one steam pump is fitted it must comply with all these requirements.

32. In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes, and all main steam pipes are to be tested by hydraulic pressure to twice the working pressure, in the presence of the Engineer Surveyor.

33. All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge-valves fitted on the plating of the vessel in an accessible position.

34. No pipes are to be carried through the bunkers without being properly protected.

35. Bilge suction-pipes are to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

36. All shafts to be examined when rough turned and finished.

37. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

For dimensions of shafts, see the formula in paragraph 46.

STEEL CASTINGS.

38. **Steel Castings** may be used for engine purposes provided they fulfil the Committee's requirements, which are as follows :—

For purposes for which **Cast Iron** is ordinarily employed, such as propellor bosses and blades, bed plates, engine framing and columns, brackets, weigh-shaft levers, pistons, cylinder covers, eccentric straps, bearing bushes, &c., the castings must be sound, and are to be subjected to such drop and hammering tests as are practicable.

For shafts or parts of shafts, and for purposes for which **forgings** are ordinarily employed the material must also be subjected to the following tests :—

A tensile test is to be made from a piece taken from each casting. The tensile strength is not to exceed 30 tons per square inch, and the elongation is not to be less than 10 per cent. in a length of 8 inches, and a cold bending test, turned to $1\frac{1}{4}$ inches diameter or planed to $1\frac{1}{4}$ inches square, is to be capable of being bent without fracture through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.

All steel castings are to be thoroughly annealed.

COCKS, PIPES, AND SEA CONNECTIONS.

39. With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and in vessels having *new engines or boilers* :—

40. All sea-cocks to be fitted on the vessel above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

41. The blow-off cocks on the vessel are to be fitted with spigots passing through the planking, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

42. Cocks and valves connecting all suction pipes are to be fixed, above the stoke-hold and engine-room platforms.

43. The arrangement of pumps, bilge injections, suction and delivery pipes, is to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement is to be reported to the Committee.

SPARE GEAR.

44. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz :—

2 connecting-rod or piston rod top end bolts and nuts,
2 connecting-rod bottom end bolts and nuts,
2 main-bearing bolts,
1 set of coupling bolts,
1 set of feed and bilge pump valves,
1 set of piston springs (where common springs are used),
A quantity of assorted bolts and nuts,
Iron of various sizes.

In addition to the foregoing, the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft,
Propeller shaft,
Propeller, or a full set of blades,
Stern bush, or lignum-vitæ lining for bush,
1 pair of connecting rod brasses,
1 pair of cross-head brasses,
1 set of link brasses,
1 eccentric strap complete,
Air pump rod,
Circulating pump rod,
H. P. valve spindle,
L. P. valve spindle,
1 set of check valves,
6 cylinder cover bolts,
6 junk ring bolts,
4 valve chest cover bolts,
2 dozen boiler tubes,
3 dozen condenser tubes,
1 cylinder escape valve and spring,
1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS OF IRON BOILERS.

45. The strength of circular shells of iron boilers to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where C = co-efficient as per following table.
T = thickness of plate in inches.
D = mean diameter of shell in inches.
B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100.$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$$B = \frac{n \times a}{p \times T} \times 90 \text{ with iron rivets in iron plates with drilled holes.}$$

(In case of rivets being in double shear, $1{\cdot}75a$ is to be used instead of a.)

where p = pitch of rivets.
d = diameter of rivets.
a = sectional area of rivets.
n = number of rows of rivets.

MEM.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula, the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates ½-inch thick and under.	For Plates ¾-thick and above ½-inch	For Plates above ¾-inch thick.
Lap Joint, Punched Holes	155	165	170
Lap Joint, Drilled Holes	170	180	190
Double Butt Strap Joint, Punched Holes	170	180	190
Double Butt Strap Joint, Drilled Holes...	180	190	200

NOTE.—The inside butt strap to be at least ¾ the thickness of the plate.

CYLINDRICAL SHELLS OF STEEL BOILERS.

The strength of cylindrical shells of steel boilers is to be calculated from the following formula :—

$$\frac{C \times (T - 2) \times B}{D} = \text{working pressure in lbs. per square inch.}$$

where D = mean diameter of shell in inches.

T = thickness of plate in sixteenths of an inch.

C = 20 when the longitudinal seams are fitted with double butt straps of equal width.

C = 19·25 when they are fitted with double butt straps of unequal width, only covering on one side the reduced section of plate at the outer lines of rivets.

C = 18·5 when the longitudinal seams are lap joints.

B = the least percentage of strength of longitudinal joint found as follows :

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times t} \times 85$ where steel rivets are used.

$B = \frac{n \times a}{p \times t} \times 70$ where iron rivets are used.

where p = pitch of rivets in inches.

t = thickness of plate in inches.

d = diameter of rivet holes in inches.

n = number of rivets used per pitch in the longitudinal joint.

a = sectional area of rivet in square inches.

In case of rivets in double shear 1·75a is to be used instead of a.

NOTE.—The inside butt strap to be at least $\frac{3}{4}$ the thickness of the plate.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the preceding tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted, to be stayed from the top of the dome or otherwise stiffened.

STAYS.

The strength of stays supporting flat surfaces is to be calculated from the smallest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

Iron Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, and for all stays which are welded, 6,000 lbs. per square inch ; for unwelded stays above $1\frac{1}{2}$ inches smallest diameter, 7,500 lbs. per square inch.

Steel Stays.—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 8,000 lbs. per square inch ; for stays above $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch. No steel stays are to be welded.

Stay Tubes.—The stress is not to exceed 7,500 lbs. per square inch.

FLAT PLATES.

The strength of flat plates supported by stays to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

P = greatest pitch in inches,

C = 90 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with screw stays with riveted heads,

C = 100 for iron or steel plates above $\frac{7}{16}$ thick fitted with screw stays with riveted heads,

C = 110 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with stays and nuts,

C = 120 for iron plates above $\frac{7}{16}$ thick, and for steel plates above $\frac{7}{16}$ and under $\frac{9}{16}$ thick, fitted with screw stays and nuts,

C = 135 for steel plates $\frac{9}{16}$ thick and above, fitted with screw stays and nuts,

C = 140 for iron plates fitted with stays with double nuts,

C = 150 for iron plates fitted with stays with double nuts and washers outside the plates, of at least $\frac{1}{3}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 160 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, of at least $\frac{2}{5}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 175 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, when the washers are at least $\frac{2}{3}$ of the pitch in diameter and of the same thickness as the plates.

For iron plates fitted with stays with double nuts and doubling strips riveted to the outside of the plates, of the same thickness as the plates, and of a width equal to $\frac{2}{3}$ the distance between the rows of stays, C may be taken as 175, if P is taken to be the distance between the rows, and 190 when P is taken to be the pitch between the stays in the rows.

For steel plates, other than those for combustion chambers, the values of C may be increased as follows :—

C = 140 increased to 175,
150 ,, 185,
160 ,, 200,
175 ,, 220,
190 ,, 240.

If flat plates are strengthened with doubling plates securely riveted to them, having a thickness of not less than $\frac{2}{3}$ of that of the plates, the strength to be taken from

$$\frac{C \times (T + \frac{t}{2})^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where t = thickness of doubling plates in sixteenths, and C, T and P are as above.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

For steel tube plates in the nest of tubes the strength to be taken from

$$\frac{140 \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = the thickness of the plates in sixteenths of an inch,

P = the *mean* pitch of stay tubes from centre to centre.

For the wide water spaces between the nests of tubes the strength to be taken from

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where P = the horizontal distance from centre to centre of the bounding rows of tubes, and

C = 120 where the stay tubes are pitched with two plain tubes between them and are not fitted with nuts outside the plates,

C = 130 if they are fitted with nuts outside the plates,

C = 140 if each alternate tube is a stay tube not fitted with nuts,

C = 150 if they are fitted with nuts outside the plates,

C = 160 if every tube in these rows is a stay tube and not fitted with nuts,

C = 170 if every tube in these rows is a stay tube and each alternate stay tube is fitted with nuts outside the plates.

The thickness of tube plates of Combustion Chambers in cases where the pressure on the top of the chambers is borne by these plates is not to be less than that given by the following rule :—

$$T = \frac{P \times W \times D}{1600 \times (D - d)}$$

where P = working pressure in lbs. per square inch.

W = width of Combustion Chamber over plates in inches.

D = horizontal pitch of tubes in inches.

d = inside diameter of plain tubes in inches.

T = thickness of tube plates in sixteenths of an inch.

GIRDERS.

The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L - P) \times D \times L} = \text{working pressure in lbs. per square inch ;}$$

where L = width between tube plates, or tube plate and back plate of chamber,

P = pitch of stays in girders,

D = distance from centre to centre of girders,

d = depth of girder at centre,

T = thickness of girder at centre. All these dimensions to be taken in inches.

Wrought Iron.

$$C = \begin{cases} 6{,}000, \text{ if there is one stay to each girder.} \\ 9{,}000, \text{ if there are two or three stays to each girder.} \\ 10{,}000, \text{ if there are four or five stays to each girder.} \\ 10{,}500, \text{ if there are six or seven stays to each girder.} \\ 10{,}800, \text{ if there are eight stays or above to each girder.} \end{cases}$$

Wrought Steel.

$$C = \begin{cases} 6{,}600, \text{ if there is one stay to each girder.} \\ 9{,}900, \text{ if there are two or three stays to each girder.} \\ 11{,}000, \text{ if there are four or five stays to each girder.} \\ 11{,}550, \text{ if there are six or seven stays to each girder.} \\ 11{,}880, \text{ if there are eight stays or above to each girder.} \end{cases}$$

CIRCULAR FURNACES.

The strength of plain furnaces to resist collapsing to be calculated from the following formula :—

$$\frac{89{,}600 \times T^2}{L \times D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plates in inches,

D = outside diameter of furnace in inches,

L = length of furnace in feet. If strengthening rings are fitted, the length between the rings is to be taken.

If the plates do not exceed $\frac{9}{16}$ in. in thickness, the pressure however, is not to exceed

$$\frac{8{,}000 \times T}{D} = \text{lbs. per square inch.}$$

If the plates are of steel and exceed $\frac{9}{16}$ in. in thickness, the pressure is not to exceed

$$\frac{8{,}800 \times T}{D} = \text{lbs. per square inch.}$$

If the furnaces are fitted with a single Adamson ring at about the middle of their length, the pressure may be calculated from

$$\frac{10{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are fitted with two Adamson rings, then the pressure may be calculated from

$$\frac{11{,}400 \times T}{D} = \text{working pressure in lbs. per square inch.}$$

If the furnaces are fitted with a series of Adamson rings at intervals not exceeding 23 inches, the pressure may be calculated from

$$\frac{1{,}000 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness in sixteenths of an inch,

D = outside diameter of furnaces.

The strength of corrugated furnaces made of steel, having a less tensile strength than 26 tons per square inch, the corrugations being 6 inches apart and $1\frac{1}{2}$ inches deep, to be calculated from

$$\frac{1{,}000 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of furnaces made of steel, having a tensile strength between 26 and 30 tons per square inch, and corrugated on Fox's or Morison's plans, to be calculated from

$$\frac{1{,}259 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of ribbed furnaces (with ribs 9 inches apart) to be calculated from the following formula :—

$$\frac{1{,}160 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch.}$$

The strength of spirally corrugated furnaces to be calculated from the following formula :—

$$\frac{912 \times (T - 2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,
and D = outside diameter of corrugated furnaces, or outside diameter of the plain part ribbed furnaces in inches.

The strength of Holmes' Patent Furnaces, in which the corrugations are not more than 16 inches apart from centre to centre, and not less than two inches high, to be calculated from the following formula :—

$$\text{Working pressure in lbs. per square inch} = \frac{945 \times (T - 2)}{D}$$

where T = thickness of plain portions of furnace in sixteenths of an inch,
D = outside diameter of plain parts of the furnace in inches.

DONKEY BOILERS.

The iron used in the construction of the fire boxes, uptakes, and water-tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any case where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULES FOR DETERMINING SIZES OF SHAFTS.

46. The diameters of crank and straight shafts are to be not less than those given by the following formula:—

For Compound Engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 04\,\mathbf{A} + \cdot 006\,\mathbf{D} + \cdot 02\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Triple expansion engines with three cranks at equal angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 038\,\mathbf{A} + \cdot 009\,\mathbf{B} + \cdot 002\,\mathbf{D} + \cdot 0165\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with two cranks at right angles—

$$\text{Diameter of crank shaft in inches} = (\cdot 034\,\mathbf{A} + \cdot 011\,\mathbf{B} + \cdot 004\,\mathbf{C} + \cdot 0014\,\mathbf{D} + \cdot 016\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with three cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot 028\,\mathbf{A} + \cdot 014\,\mathbf{B} + \cdot 006\,\mathbf{C} + \cdot 0017\,\mathbf{D} + \cdot 015\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with four cranks—

$$\text{Diameter of crank shaft in inches} = (\cdot 033\,\mathbf{A} + \cdot 01\,\mathbf{B} + \cdot 004\,\mathbf{C} + \cdot 0013\,\mathbf{D} + \cdot 0155\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

where $\mathbf{A}$ = diameter of High Pressure Cylinder in inches,
$\mathbf{B}$ = diameter of first Intermediate Cylinder in inches,
$\mathbf{C}$ = diameter of second Intermediate Cylinder in inches,
$\mathbf{D}$ = diameter of Low Pressure Cylinder in inches,
$\mathbf{S}$ = Stroke of Pistons in inches,
$\mathbf{P}$ = Boiler pressure above atmosphere in lbs. per square inch.

The Screw shaft to be the same diameter as is required for the crank shaft.

Intermediate shafting should be at least $\frac{19}{20}$ of the diameter required for the crank shaft.

NOTE.—The Rules are intended to apply to Two Cylinder Compound Engines, in which the ratio of areas of Low and High Pressure Cylinders does not exceed 4·5 to 1; to Triple Expansion Engines in which it does not exceed 9 to 1; to Quadruple Expansion Engines in which it does not exceed 12 to 1; and in all cases, as regards the stroke, in which the length of stroke is not less than one half the diameter or greater than the diameter of the Low Pressure Cylinder. Engines of extreme proportions beyond these limits being specially submitted to be dealt with on their merits.

PERIODICAL SURVEYS. (*See* N.B. at foot.)

47. The machinery and boilers of all steam ships are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey upon the occasion of the vessels undergoing the Special periodical Surveys prescribed in the Rules, unless the machinery and boilers have been specially surveyed within a period of twelve months.

48. At these Special Surveys the propeller, stern-bush, and fastenings of the sea connections are to be examined while the vessel is in dry dock, and if deemed necessary by the Surveyor, the stern shaft is to

be drawn and examined at least once in four years, and more frequently if deemed necessary by the Surveyors.

49. The cylinders, pistons, slide valves, crank shaft, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

50. The sea connections and arrangements of cocks, pipes, bilge-suctions, roses, &c., are to be examined.

51. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

52. The safety valves are to be examined and set to the safe working pressure.

53. If satisfactory, these Surveys will be recorded in the Register Book thus:—"LMC 9,91" *in red;* or "B&MS 9,91" *in red.*

54. "LMC." (LLOYD'S MACHINERY CERTIFICATE), with a date, denotes that the machinery and boilers are fitted in accordance with the Rules, and were found upon examination at that time to be in good condition.

55. "B&MS." (BOILERS AND MACHINERY SURVEYED), with a date, denotes that the boilers and machinery though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

56. In the event of either the machinery or boilers appearing to be impaired to such an extent as renders it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

57. The boilers of all steam ships are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

58. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

59. The safety valves are to be examined and set to the safe working pressure.

60. If satisfactory, these surveys will be recorded in the Register Book, thus: "BS9,91" *in red.*

61. "BS" (BOILERS SURVEYED), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

62. In the event of the boilers appearing to be impaired to such an extent as renders it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

63. In Steam Vessels, the engines and boilers are to be considered as part of the equipment. (*See* Section 46).

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE No. 438.*

BOILERS MADE OF STEEL.

NOTICE is hereby given, that the Committee of this Society have this day passed the following resolutions amending Notice No. 397 in regard to boilers made of steel :—

1. The use of steel will be sanctioned in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, provided the boilers be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled.

2. The material is to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section,* with an ultimate elongation of not less than 20 per cent. in a length of eight inches. It is to be capable of being bent to a curve of which the inner radius is not greater than one and a half times the thickness of the plates or bars, after having been heated uniformly to a low cherry-red and quenched in water of 82° Fahrenheit.

Steel rivets are to be considered as part of the material, and in addition to being subjected to a shearing test, they must be capable of withstanding the same tests as the plates are required to undergo.

3. Samples for testing are to be selected from each batch of plates submitted for approval, care being taken in the selection that, as far as possible, each cast or furnace charge from which the material has been produced is represented.† In addition to these tests, the temper test is to be applied to samples taken from *every* plate intended to be used in the furnaces and combustion chambers of the boilers.

4. The Society's Surveyor will attend at the steel works when necessary, and select the samples for testing before the plates are sheared to size, and these samples when marked by him for testing should, as far as practicable, be followed by the Surveyor through the different stages of preparation until the tests are completed.

5. The Society's Surveyor will require to have every facility placed in his way for tracing all plates to their respective charges, and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the tests applied to the material, is to be signed and forwarded to the boiler manufacturer, and the other is to be retained by himself.

6. The samples are taken for testing in order that the general quality of the material may be ascertained, and if any sample should fail to fulfil the conditions laid down, the plate from which the sample is taken must be rejected ; and further tests should be made before any material, made from the same cast or charge as the failing sample, can be approved.

* Steel of a less tensile strength than 26 tons per square inch, if satisfactory in other respects, may be allowed in any case where the scantlings are equal to those prescribed in the Rules for iron boilers. In such cases the Surveyors should represent the facts for the Committee's consideration.

† When a great number of charges are represented in the number of plates submitted, a proportion of one tensile and one temper test to every ten plates will be deemed sufficient, provided they all prove to be satisfactory.

7. All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

8. All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

9. No steel stays are to be welded.

10. Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.

19th May, 1881.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION, &c.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	...	...	...	£1	1 0
For each succeeding visit, when more than one visit is necessary	...	...	...	0	10 6

For special surveys special charges will be made, subject to the control of the Committee.

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an A1* or an A1* certificate; and once in every three years for vessels with an A1, A1, A or an A certificate. When vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Monthly Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

First Survey.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally, and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

Second Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.

The windlass must be unhung when the main piece is of wood ; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

Third Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

Fourth Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast-trim water line.

Fifth Survey.

The vessel must be submitted to the same survey as before described for "Second Survey."

Sixth Survey or Special Survey.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions :—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee, she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time ; and, before completing the report, the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an A1* or **A1*** certificate, ten years for vessels with an A1 or **A1** certificate, and nine years for vessels with an A or **A** certificate ; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an A1* or **A1*** certificate, twenty years for vessels with an A1 or **A1** certificate, and eighteen years for vessels with an A or **A** certificate.

The symbols of class when printed within brackets thus (A1*)— indicate that the class of the Vessel has lapsed for want of Survey, and when printed within brackets thus (A1*) (—), that the class has been withdrawn by request of the Owners.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
2, WHITE LION COURT, CORNHILL, E.C.
1st September, 1885.

EXTRACTS FROM THE RULES of the late UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING).

EQUIPMENT FOR STEAM VESSELS.

Section 29.—The equipment of Anchors and Chain Cables and Hawsers to be in accordance with TABLE 14 for Steam Vessels (*see below*).

The tonnage regulating equipment is to be the gross register tonnage under upper deck, with the addition of three-tenths of the tonnage of erections above upper deck.

TABLE No. 14.—ANCHORS, CHAINS, AND HAWSERS FOR STEAM VESSELS.

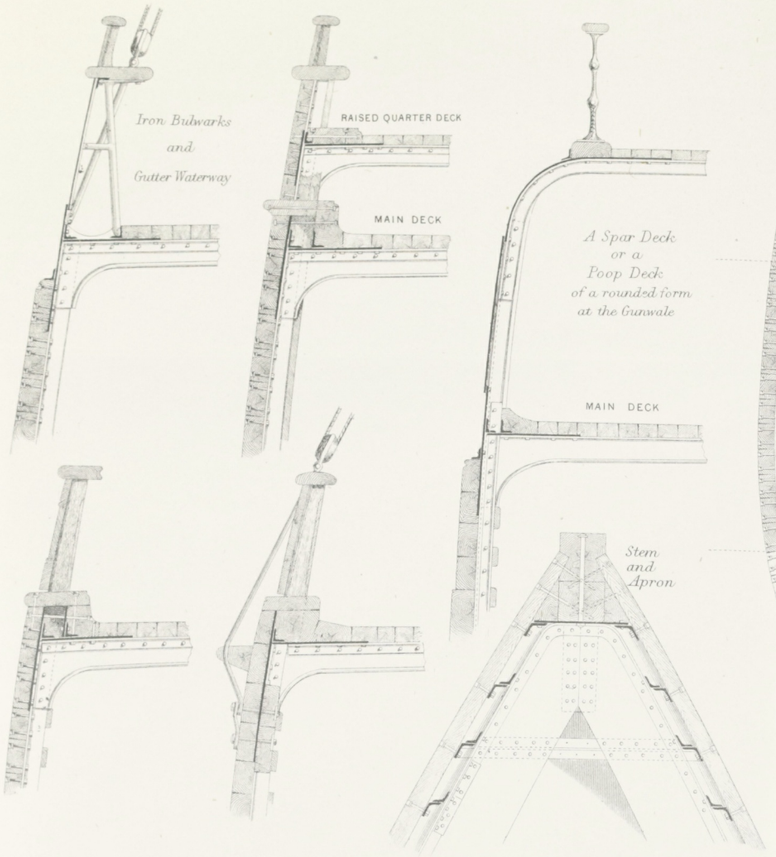
VESSELS TONNAGE. *See Section 29.*	Anchors, with either Iron or Wood Stocks.								Stud-chain Cables.			Stream Chain.		Hawsers and Warps.				VESSELS TONNAGE. *See Section 29.*
	Number.			Weight.														
				Bowers.		Stream.	Kedge.	2d Kedge.	Minimum Size.	Proved to Admiralty Test.	Length.			Tow Rope.	Hawsers.	Warps.	Length.	
	Bowers.	Stream.	Kedges.	Without Stock.	Admiralty Test.													
Tons. Tons.				Cwt.	Tons.	Cwt.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Fath.	Size.	Inches.	Inches.	Inches.	Fath.	Tons. Tons.
100 and under 150	2	1	...	3	4·9	1	...	...	$1\frac{1}{16}$	8·1	120	45	$\frac{8}{16}$	$5\frac{1}{2}$	$3\frac{1}{2}$	...	90	100 and under 150
150 „ 188	2	1	1	4	6·4	$1\frac{3}{4}$	1	...	$1\frac{3}{16}$	11·9	150	45	$\frac{9}{16}$	6	4	...	90	150 „ 188
188 „ 225	2	1	1	$5\frac{1}{4}$	7·6	2	1	...	$1\frac{4}{16}$	13·8	165	45	$\frac{10}{16}$	6	4	...	90	188 „ 225
225 „ 263	2	1	1	6	8·2	$2\frac{1}{2}$	$1\frac{1}{4}$	...	$1\frac{5}{16}$	15·8	165	45	$\frac{10}{16}$	$6\frac{1}{2}$	4	...	90	225 „ 263
263 „ 300	2	1	1	$7\frac{1}{4}$	9·5	$2\frac{3}{4}$	$1\frac{1}{4}$	...	1	18	165	45	$\frac{11}{16}$	7	5	...	90	263 „ 300
300 „ 375	3	1	1	$8\frac{1}{4}$	10·4	3	$1\frac{1}{2}$	...	$1\frac{1}{16}$	20·3	165	60	$\frac{11}{16}$	$7\frac{1}{2}$	$5\frac{1}{2}$	...	90	300 „ 375
375 „ 450	3	1	2	10	12·0	$4\frac{3}{4}$	$2\frac{1}{4}$	1	$1\frac{2}{16}$	22·8	195	60	$\frac{12}{16}$	8	6	...	90	375 „ 450
450 „ 525	3	1	2	12	13·9	5	$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{16}$	25·4	195	60	$\frac{12}{16}$	$8\frac{1}{2}$	$6\frac{1}{2}$	...	90	450 „ 525
525 „ 600	3	1	2	$13\frac{1}{2}$	15·2	6	3	$1\frac{1}{2}$	$1\frac{4}{16}$	28·1	210	60	$\frac{13}{16}$	9	7	...	90	525 „ 600
600 „ 675	3	1	2	$15\frac{1}{4}$	16·7	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{16}$	31	210	60	$\frac{13}{16}$	$9\frac{1}{2}$	7	4	90	600 „ 675
675 „ 750	3	1	2	$16\frac{3}{4}$	18·0	7	$3\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{6}{16}$	34	240	60	$\frac{14}{16}$	10	8	5	90	675 „ 750
750 „ 900	3	1	2	18	19·0	8	4	2	$1\frac{7}{16}$	37·2	240	60	$\frac{14}{16}$	10	8	5	90	750 „ 900
900 „ 1050	3	1	2	21	21·6	9	$4\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{8}{16}$	40·5	240	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	900 „ 1050
1050 „ 1200	3	1	2	$23\frac{1}{2}$	23·5	10	5	$2\frac{1}{2}$	$1\frac{9}{16}$	44	270	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	1050 „ 1200
1200 „ 1350	3	1	2	$25\frac{1}{2}$	25·2	$10\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{10}{16}$	47·5	270	75	1	10	$9\frac{1}{2}$	6	90	1200 „ 1350
1350 „ 1500	3	1	2	$27\frac{3}{4}$	26·9	11	$5\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{11}{16}$	51·2	270	75	1	10	10	6	90	1350 „ 1500
1500 „ 1800	3	1	2	30	28·6	12	6	3	$1\frac{12}{16}$	55·1	270	75	$1\frac{1}{16}$	11	$10\frac{1}{2}$	$6\frac{1}{2}$	90	1500 „ 1800
1800 „ 2100	3	1	2	32	30·1	13	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{13}{16}$	59·1	270	75	$1\frac{1}{16}$	11	11	7	90	1800 „ 2100
2100 „ 2400	3	1	2	34	31·6	$13\frac{1}{2}$	$6\frac{3}{4}$	$3\frac{1}{4}$	$1\frac{14}{16}$	63·3	270	75	$1\frac{2}{16}$	11	11	7	90	2100 „ 2400
2400 „ 2700	3	1	2	$36\frac{1}{2}$	33·4	14	7	$3\frac{1}{2}$	$1\frac{15}{16}$	67·6	270	90	$1\frac{2}{16}$	12	12	8	90	2400 „ 2700
2700 „ 3000	3	1	2	38	34·5	$14\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	2	72	270	90	$1\frac{3}{16}$	12	12	8	90	2700 „ 3000
3000 „ 3450	3	1	2	40	35·7	15	$7\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{16}$	76·6	270	90	$1\frac{3}{16}$	12	12	8	90	3000 „ 3450
3450 „ 3900	3	1	2	41	37·0	16	8	$4\frac{1}{4}$	$2\frac{2}{16}$	81·3	300	90	$1\frac{3}{16}$	12	12	8	90	3450 „ 3900
3900 „ 4500	4	1	2	43	38·0	$17\frac{1}{2}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{16}$	86·1	300	90	$1\frac{4}{16}$	12	12	9	90	3900 „ 4500
4500 „ 5250	4	1	2	45	39·2	19	$9\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{4}{16}$	91·1	330	90	$1\frac{4}{16}$	12	12	9	90	4500 „ 5250
5250 „ 6000	4	1	2	47	41	21	10	5	$2\frac{5}{16}$	96	330	90	$1\frac{5}{16}$	12	12	9	90	5250 „ 6000

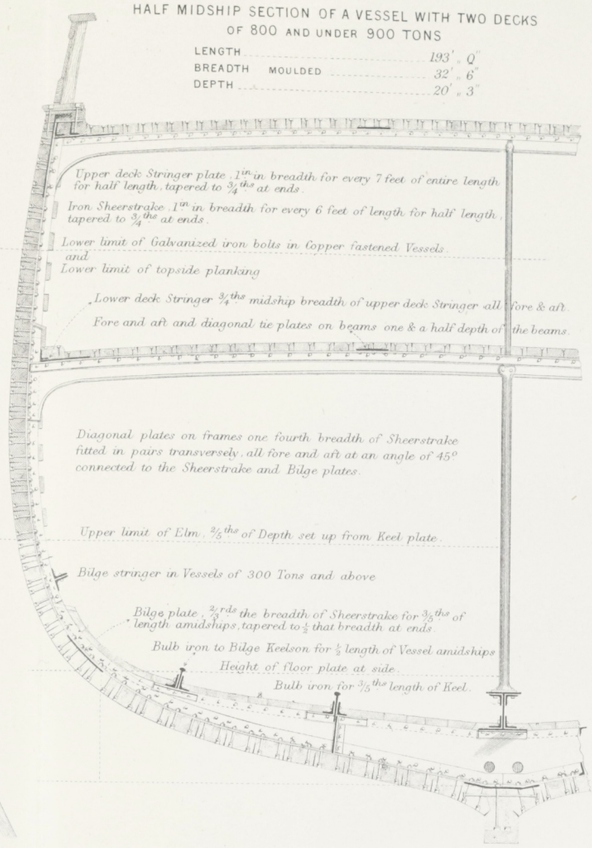
Anchors and Chains to be tested to Admiralty proof. A reduction of 15 per cent. will be allowed in the weight of the Third and Fourth Bower.

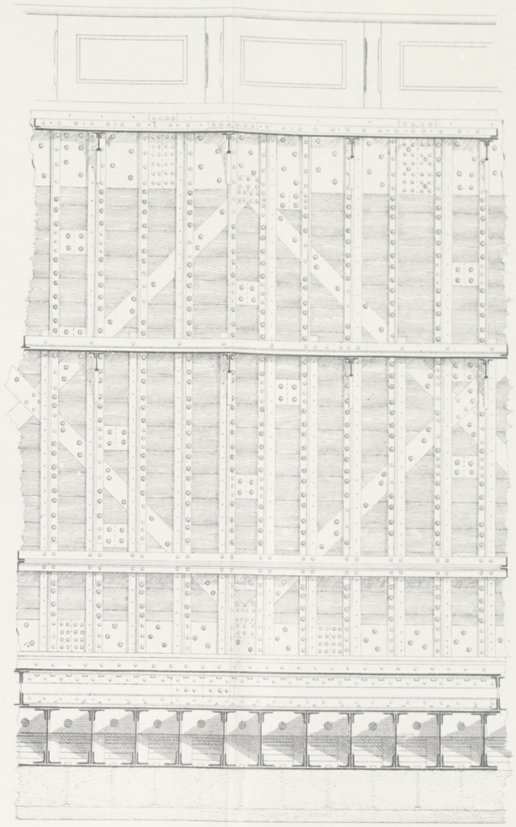
LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

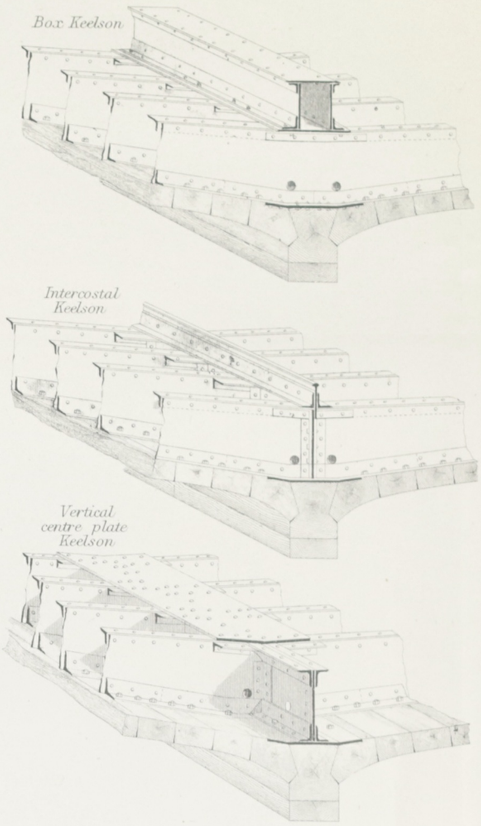
ILLUSTRATIONS OF THE SUGGESTIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF COMPOSITE SHIPS

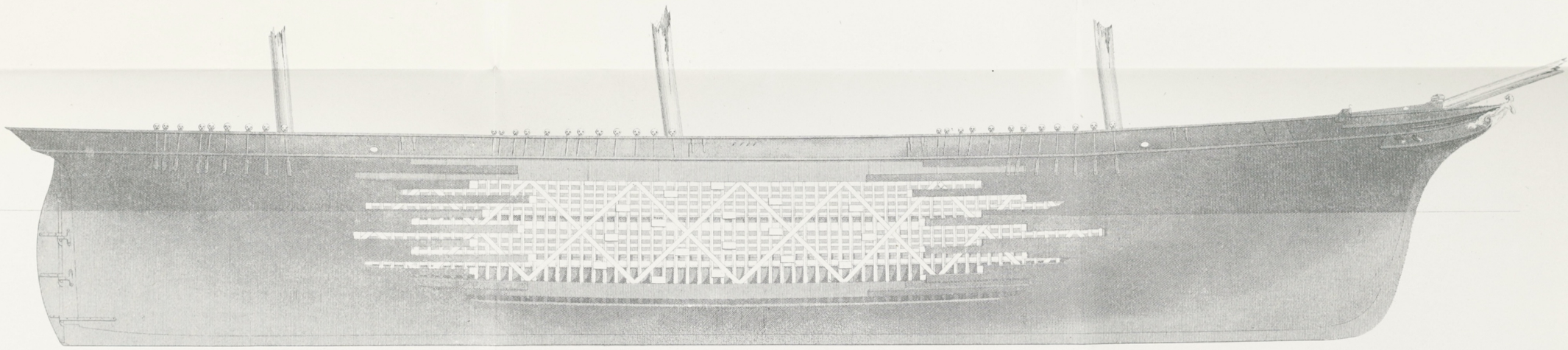
1868











Drawn by H. Cornish, Lloyd's Surveyor

T.W. Lee Sculr

EXTRA

Sect

The
erections

VESSELS TONNAGE. *See Section 29.*	
Tons.	To
100 and under	1
150 „	1
188 „	2
225 „	2
263 „	3
300 „	3
375 „	4
450 „	5
525 „	6
600 „	6
675 „	7
750 „	9
900 „	10
1050 „	12
1200 „	13
1350 „	15
1500 „	18
1800 „	21
2100 „	24
2400 „	27
2700 „	30
3000 „	34
3450 „	39
3900 „	45
4500 „	52
5250 „	60

Anchor

LLOYD'S REGIST

2 WI

COMPOSITE VESSELS.

Table of Minimum Dimensions of Frames, Planking, Keels,

All plates, and all beam and angle iron, used in ships intended for classification, are to be stamped

Tonnage. *See Notes to Table.*	Distance of Frames from Moulding Edge to Moulding Edge all Fore and Aft.	Siding of Keel, Stem and Stern Post and Moulding of Stem.	Moulding of Stern Post and Keel.	Breadth and Thickness of Keel Plate, Flat Plate Keelson, and Thickness of Single Plate Vertical Keelson, standing upon Floors		Dimensions of Angle Iron for Frames, and the Lower Angle Irons of Box Keelsons.	Dimensions of Angle Iron for Reverse Frames, and the Top Angle Irons of Box Keelsons.	Thickness of Centre Plate Keelson, Sheerstrake, (where not planked over), also of Butt Plates for Planking in Midships.	Thickness of Floor Plates, Hooks, Crutches, Side Intercostal and Box Keelson.	Thickness of Stringer Plates upon Beam Ends, Tie Plates on Beams, Sheerstrake (where planked over) and Topside Plating (where not planked over). Bilge Strake and Diagonal Plates on Frames and Middle Line Intercostal Keelsons.
				Breadth	Thickness					
Tons.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
50 and under 100	18	$9\frac{1}{2}$	11	19	$\frac{8}{16}$	$2\frac{3}{4} \times 2\frac{3}{4} \times \frac{5}{16}$	$2\frac{1}{4} \times 2\frac{1}{4} \times \frac{4}{16}$	$\frac{6}{16}$	$\frac{5}{16}$	$\frac{5}{16}$
100 and under 200	18	$10\frac{1}{2}$	12	21	$\frac{9}{16}$	$2\frac{3}{4} \times 2\frac{3}{4} \times \frac{6}{16}$	$2\frac{1}{4} \times 2\frac{1}{4} \times \frac{5}{16}$	$\frac{7}{16}$	$\frac{5}{16}$	$\frac{6}{16}$
200 and under 300	18	$11\frac{1}{2}$	13	23	$\frac{10}{16}$	$3 \times 3 \times \frac{6}{16}$	$2\frac{1}{4} \times 2\frac{1}{4} \times \frac{5}{16}$	$\frac{8}{16}$	$\frac{6}{16}$	$\frac{7}{16}$
300 and under 400	18	$12\frac{1}{2}$	14	25	$\frac{10}{16}$	$3 \times 3 \times \frac{6}{16}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{8}{16}$
400 and under 500	18	13	$14\frac{1}{2}$	26	$\frac{11}{16}$	$3\frac{1}{4} \times 3\frac{1}{2} \times \frac{7}{16}$	$2\frac{1}{2} \times 2\frac{3}{4} \times \frac{6}{16}$	$\frac{9}{16}$	$\frac{7}{16}$	$\frac{8}{16}$
500 and under 600	18	$13\frac{1}{2}$	15	27	$\frac{11}{16}$	$3\frac{1}{4} \times 3\frac{1}{2} \times \frac{7}{16}$	$2\frac{1}{2} \times 3 \times \frac{6}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$
600 and under 700	18	14	$15\frac{1}{2}$	28	$\frac{12}{16}$	$3\frac{1}{2} \times 4 \times \frac{8}{16}$	$2\frac{3}{4} \times 3 \times \frac{6}{16}$	$\frac{10}{16}$	$\frac{8}{16}$	$\frac{9}{16}$
700 and under 800	18	$14\frac{1}{2}$	16	29	$\frac{12}{16}$	$3\frac{1}{2} \times 4 \times \frac{8}{16}$	$3 \times 3 \times \frac{6}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{10}{16}$
800 and under 900	18	15	$16\frac{1}{2}$	30	$\frac{13}{16}$	$3\frac{3}{4} \times 4\frac{1}{2} \times \frac{9}{16}$	$3 \times 3 \times \frac{7}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{10}{16}$
900 and under 1000	18	$15\frac{1}{2}$	17	31	$\frac{13}{16}$	$3\frac{3}{4} \times 4\frac{1}{2} \times \frac{9}{16}$	$3 \times 3\frac{1}{4} \times \frac{7}{16}$	$\frac{12}{16}$	$\frac{10}{16}$	$\frac{11}{16}$
1000 and under 1200	18	16	$17\frac{1}{2}$	32	$\frac{14}{16}$	$3\frac{3}{4} \times 4\frac{3}{4} \times \frac{9}{16}$	$3 \times 3\frac{1}{2} \times \frac{8}{16}$	$\frac{12}{16}$	$\frac{10}{16}$	$\frac{11}{16}$
1200 and under 1500	18	$16\frac{1}{2}$	18	33	$\frac{14}{16}$	$3\frac{3}{4} \times 4\frac{3}{4} \times \frac{9}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$\frac{13}{16}$	$\frac{11}{16}$	$\frac{12}{16}$
1500 and under 2000	18	17	$18\frac{1}{2}$	34	$\frac{15}{16}$	$4 \times 5 \times \frac{10}{16}$	$3\frac{1}{2} \times 4 \times \frac{9}{16}$	$\frac{13}{16}$	$\frac{11}{16}$	$\frac{12}{16}$
2000 and under 2500	18	$17\frac{1}{4}$	19	$34\frac{1}{2}$	$\frac{15}{16}$	$4 \times 5\frac{1}{2} \times \frac{10}{16}$	$3\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$\frac{14}{16}$	$\frac{12}{16}$	$\frac{13}{16}$
2500 and under 3000	18	$17\frac{1}{4}$	$19\frac{1}{4}$	$34\frac{1}{2}$	$\frac{15}{16}$	$4 \times 6 \times \frac{11}{16}$	$3\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$\frac{14}{16}$	$\frac{12}{16}$	$\frac{13}{16}$
3000 and under 3500	18	$17\frac{1}{2}$	$19\frac{1}{2}$	35	$\frac{16}{16}$	$4 \times 6\frac{1}{2} \times \frac{11}{16}$	$3\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$\frac{15}{16}$	$\frac{12}{16}$	$\frac{13}{16}$

MEM.—The scantlings given in the above Table are intended for Ships the length of which, measured from the fore part of the Stem to the after part of the Stern-post on the range of the Upper Deck, does not exceed seven times their moulded breadth or ten times their depth of Hold, taken from the upper part of Floors to the top of the Upper Deck Beams.

RIVETS.	$\frac{5}{8}$ of an Inch.		$\frac{3}{4}$ of an Inch.		
Diameter of Rivets required for Thickness of Plates - - - -	$\frac{5}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$

Lloyd's Register of Shipping, London, 15th May, 1879.

TABLE **H.**

Keelsons, Stems, Stern Posts, Floor Plates, Beams, Stringers, &c.*

legibly in two places with the manufacturer's trade mark, or his name and the place where made.

Dimensions of Angle Iron on Beam Stringers, Stringers in Hold, and Keelsons.	Diameter of Solid Pillars to Beams.		Thickness of Outside Plank.		Thickness of Upper Deck, and Plank-sheer. *See Notes to Table.*	Thickness of Wood Ceiling in Hold to upper part of Bilges.	Windlass. *See Notes to Table.*		Main Piece of Rudder from Lower Part of Counter upwards, Pall Bitt and Wood Keelson, Sided and Moulded.	Tonnage. *See Notes to Table.*
	Hold.	Deck.	From the Garboard Strake up to within one-fifth of the Depth of Hold set down below the Upper Deck Stringer.	Topsides from the Plank-sheer to within one-fifth of the Depth of Hold set down below the Upper Deck Stringer.			Diameter of Iron Spindle.	Diameter of Main Piece.		
inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	Tons.
3 × 3 × $\frac{5}{16}$	—	2	4	2½	2¾	1½	2¼	12½	9½	50 and under 100
3 × 3 × $\frac{6}{16}$	2½	2¼	4	3	3	1½	2½	14	11	100 and under 200
3 × 3 × $\frac{6}{16}$	2¾	2⅜	4½	3½	3¼	1¾	2¾	15	12	200 and under 300
3 × 3½ × $\frac{6}{16}$	2⅞	2⅜	4½	3½	3½	2	3	16	13	300 and under 400
3 × 4 × $\frac{6}{16}$	3	2½	5	4	3½	2¼	3¼	17	14	400 and under 500
3½ × 4 × $\frac{7}{16}$	3⅛	2½	5	4	3¾	2½	3½	18	14¾	500 and under 600
3½ × 4½ × $\frac{7}{16}$	3¼	2½	5½	4½	3¾	2½	3⅝	19	15½	600 and under 700
4 × 4½ × $\frac{8}{16}$	3⅜	2½	5½	4½	4	2¾	3¾	20	16	700 and under 800
4 × 5 × $\frac{8}{16}$	3½	2½	6	4¾	4	2¾	4	21	16¼	800 and under 900
4 × 5 × $\frac{9}{16}$	3½	2⅝	6	4¾	4	2¾	4¼	22	16½	900 and under 1000
4½ × 5 × $\frac{9}{16}$	3½	2⅝	6¼	5	4	3	4½	23	16¾	1000 and under 1200
4½ × 5½ × $\frac{9}{16}$	3⅝	2⅝	6¼	5	4	3	4⅝	24	17	1200 and under 1500
5 × 6 × $\frac{9}{16}$	3¾	2¾	6½	5¼	4	3	4⅝	25½	17½	1500 and under 2000
5½ × 6½ × $\frac{10}{16}$	3¾	2¾	7	5¾	4	3	4¾	27	18	2000 and under 2500
5½ × 6½ × $\frac{10}{16}$	3¾	2¾	7½	6	4	3	4¾	28½	19	2500 and under 3000
5½ × 6½ × $\frac{10}{16}$	3¾	2¾	8	6	4	3	5	30	20	3000 and under 3500

For Ships which exceed these proportions, the plans to be submitted for the Committee's consideration. The depth for defining the proportions of spar decked vessels, is to be measured from the top of the floor plates to the upper side of the middle or tonnage deck beams.

$\frac{7}{8}$ of an Inch.				1 Inch.			Diameter of Nut and Screw Bolts for Fastening Flat of Deck
$\frac{10}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{16}{16}$	3 ins. and under 3½ ins. - - $\frac{1}{2}$ inch 3½ „ „ 4 „ - - $\frac{9}{16}$ „ 4 inches - - - - - - - - $\frac{5}{8}$ „

* *For Notes relating to Table H see back.*

NOTES TO TABLE H.

TONNAGE.—In flush-decked vessels having either one, two, or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel. In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, or awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment, and also the size of the main piece of rudder and windlass, and the keel and keelsons and their number, and the scantling of the stringer plates on the upper and lower deck beams, and the requirements as to double riveting. But in vessels where the tonnage of the erections above the tonnage deck is less than that required for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment and the size of the main piece of rudder and windlass, and the keel and keelsons and their number, the scantling of the stringer plates on the upper and lower deck beams, and the requirements for double riveting.

WOOD KEEL, Stem, and Stern Post to be of the dimensions specified in Table.

KEEL PLATE.—The keel plate to be of the breadth and thickness prescribed in Table H, to be made continuous up the apron and up the inner stern-post as high as practicable, but in all cases to extend above the lower deck or hold beam stringer angle iron. Forward and aft the plate is to be curved to the form of the bearding line, and to be one-sixteenth of an inch thicker than prescribed in the Table, where it passes over the deadwoods, apron, and inner stern-post, and to be sided as required by the form of the vessel, to have an angle iron of the size given in Table for stringer angle irons riveted on each edge, flanged to the form of the vessel to receive the plank fastenings. The keel plate to maintain its breadth for three-fifths the length of the keel amidships, and then to be gradually reduced until its edges conform with the flange of the angle iron on the keel plate forward and aft; the butts of the keel plates to be shifted clear of the keel scarphs.

FRAMES.—The frames to be of the dimensions as set forth in Table, and the narrow flange to be of a parallel thickness, that the nuts of the screw bolts may fit closely. The frames to be in as long lengths as possible, fitted and riveted on to the keel plate, and extended as near to the middle line as practicable, according to the plan of construction adopted, and in all cases to extend to the gunwale, and where raised quarter decks, poops, forecastles and spar decks are constructed, to their deck stringers respectively, except when constructed with a rounded form at the gunwale, then they may terminate at the lower part of the curve; if the frames be welded, the welds to be perfect with not less than four feet shifts from the welds of next frames, or if butted to have not less than four feet shifts with four feet lengths of angle iron of the same size as the frame, fitted back to back riveted to them, and secured to the outside planking. The spacing of the frames (where one thickness of planking in the bottom is intended) not to exceed 18 inches from moulding edge to moulding edge all fore and aft, a four feet length of angle iron, the size of the frame, is to be riveted to each floor and to the keel plate, back to back with the frames.

FLOOR PLATES.—The floor plates to be in thickness according to Table, but at each end of the vessel for one quarter of her length they may be reduced in thickness one-sixteenth of an inch where the midship floor plates are six-sixteenths and under ten-sixteenths of an inch, and two-sixteenths of an inch where the plates are ten-sixteenths and above in thickness. The floor plates to be in depth at middle line according to the following rule, viz., to the vessel's depth, measured from the top of the keel to the top of the upper or spar-decked beams amidships add the extreme breadth of the vessel, two-fifths of that sum in inches to be the depth of the floor plates at the middle line well fore and aft, but at the extreme fore and after ends, they must be deeper, so as to form an efficient connection between the two sides of the vessel. The floor plates are to extend up the bilges not less than to a perpendicular height of *twice* and a *half* the depth of floor amidships, from upper side of keel at middle line; and in no case to be less moulded in any part, than a fair taper between the depth at middle line, and the moulding at their extreme ends, which is to be not less than the moulding of the frames. The ends of the floors to maintain the height prescribed amidships, for one quarter of the vessel's length, they may then be gradually lowered forward and aft until the upper edges of the floor plates are level, which place is to be determined by the form of the vessel, and from that point to the vessel's ends they are to be gradually increased in depth, so as to efficiently connect the sides of the vessel; the upper parts of the floors forward and aft are to be high enough to give ample room between the reverse frames on each side of the vessel, for fitting the keelson angle irons. In vessels having considerable rise of floor, the depth of the floor plates, on a square, at the quarter of the vessel's extreme moulded breadth, set out from the middle line, is to be not less than three-fifths the depth of the floor plate, at the middle line, and the floor plate is to be extended up the bilges, by a fair taper from middle line, until it terminates at the moulding of the frames. A floor plate to be fitted and riveted to every frame, and to be extended across the middle line; but where a vertical centre plate is adopted at middle line, then the floor plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames. When floors extend from side to side and are made in two lengths, the butts are to have double butt straps, one on each side of the floor plates, and three-fourths the thickness of the floor plates, or else the floor plates must be lapped and treble riveted.

WATERCOURSES.—Watercourses are to be formed through all the floor plates, on each side of the middle line and at the bilges above the frames, so as to allow water to reach the pumps freely, and also through the vertical centre plate, and intercostal keelsons when such keelsons are adopted.

REVERSED FRAMES.—Reversed angle irons on frames to be in size as per Table. All vessels under 200 tons to have reversed angle-iron riveted to every frame and floor plate, across the middle line, extended to the height of the upper part of the bilge, and to the gunwale on alternate frames, and to have double reversed angle irons in way af all keelsons and stringers in hold; and in addition, all vessels of 200 tons and upwards, to have reversed angle-iron extended to the upper deck beam stringer on alternate frames, and where raised quarter decks and spar-decks are constructed, to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the curve; and on the remaining frames reversed angle-irons are to be fitted to above the height of the lower deck or hold beam stringer angle-iron, if the vessel has two decks or tiers of beams, and to above the height of the middle deck beam stringer angle-iron, if the vessel has three decks or tiers of beams, the rivets for securing the reversed angle-iron to the frames and floor plates to be in diameter as specified in Table, and be spaced not to exceed a distance of nine times their own diameter from centre to centre; butts of reversed angle-iron to be secured with butt straps.

NOTES TO TABLE H.—*continued.*

BEAMS.—Beams to be of bulb plate, with double angle-irons on the top edge, or of T bulb iron, or of any other approved form of equal strength. The upper deck beams to be one quarter of an inch in depth to every foot in length of the midship beam, and to be in thickness one-sixteenth of an inch for every inch in depth, with one-sixteenth of an inch added ; if of T bulb the united breadth of the top flanges to be not less than three-fourths the depth of the beam, and where beams are formed of bulb plate with double angle-irons on the top edge, the flanges of each of the angle-irons are not to be less in their united breadth than three-fourths the depth of the beam, and to be one-sixteenth of an inch in thickness for every inch of the two sides of the angle-iron. Middle deck, hold, and orlop beams, to be one-eighth of the depth deeper, and one-sixteenth of an inch thicker than the upper deck beams. All beams to be efficiently connected with the frames by bracket ends, or knee plates, the arms of each to be not less than twice-and-a-half the depth of the beams in length, and of not less thickness than the beams. All beams for at least three-quarters the length of the vessel in midships, and in addition the beams under the bowsprit, pall bit, windlass and capstan are to be pillared ; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper deck, or spar-deck, and to be of the sizes given in Table.

IRON SHEERSTRAKE.—The iron sheerstrake *to be one inch in breadth for every six feet of the vessel's length*, for half her length in midships, and to be of the thickness given in Table ; it may then be gradually reduced in breadth and in thickness to three-fourths of the midship breadth and thickness at her ends. The butts of the iron sheerstrake in all cases to be shifted clear of the butts of the stringer plates on the beam ends, the shift in no case to be less than equal to three spaces of frames, and all plates where practicable to be not less than nine feet long, but if the sheerstrake plates are eighteen feet long they may be of two equal breadths, but carvel plated and single riveted ; butts of all plating to be fitted quite close, and in no case is the lower edge of the iron sheerstrake to be fitted less than two-thirds of the breadth required by the Rule for sheerstrake below the upper deck stringer plate. The butt straps in all cases to be in one piece, whether fitted outside or inside, and in no case to be in two pieces by being cut at the stringer plate. *See Section* 30.

IRON BILGE STRAKE.—The bilge strake plates to be two-thirds the breadth of the iron sheerstrake, for three-fifths the length of the keel in midships, and from thence to the ends of the vessel they are to be reduced gradually to one-half their midship breadth ; the thickness of the plates to be as prescribed in Table H, and they are to be fitted at the bilges with the middle of the plate at the height prescribed for floorheads, such position for the bilge plates to be maintained, notwithstanding that the floorheads may be carried higher. They are to be extended to the ends of the vessel in accordance with her form, and properly riveted to the frame.

DIAGONAL PLATES ON FRAMES.—The diagonal plates on the frames to be not less than one-third the breadth of the iron sheerstrake, and fitted in pairs, transversely, all fore and aft, at an angle of 45°, with the butts of each pair meeting between the frames ; to be of the thickness given in Table, and connected to the sheer and bilge strake plates by butt straps double riveted, and to be efficiently riveted to each other, and to each frame they cross.

STRINGER PLATES.—All vessels to have stringer plates of the thickness given in Table upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one, two, and three decked vessels *to be in width one inch for every seven feet of the vessel's entire length for half her length in midships, and from thence to the ends of the vessel they may be gradually reduced to three-fourths the width in midships ;* in no case however is the width in midships to be less than eighteen inches. The stringer plates are to be riveted to the beams and properly shifted, fitted home, and riveted to the iron sheerstrake, with an angle iron of the dimensions given in Table, and the roughtree stanchions are not to pass through them. Stringer plates on the ends of beams below the upper deck may be reduced in width to three-fourths the midship breadth of the upper deck stringer, which breadth is to extend all fore and aft, and to have an angle iron of the dimensions given in Table, extending all fore and aft, riveted to reverse angle iron on each frame and to the stringer plates. In cases where a deck is not laid, and the width of the stringer plate on ends of hold beams is objected to, it may be reduced in width, provided such reduction be fully compensated for. All stringer angle irons are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron or plate iron not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than the angle iron they cover. Upper deck gutter waterways are to be flooded to ascertain if there be any leakage, and when completed they are to be properly cemented.

TIE PLATES.—All vessels are to have tie plates ranging all fore and aft upon each side of the hatchways on each tier of beams, and in addition thereto the beams of the upper and middle decks in three decked or spar decked vessels, and of the upper deck in vessels of one or two decks must have tie plates fitted from side to side diagonally, in number one pair for about every 35 feet of the vessel's length ; these plates in both cases must not be less in width than once and a half the depth of the beams of their respective decks, and of the thickness required for stringer plates ; they are to be well riveted to each other and to the beams and stringers, and to have intermediate fastenings into the deck plank between the beams, in all cases their butts to be chain riveted. Upon hold beams where a deck is not to be laid, a tie formed of double angle irons of the size given for the main frames of the ship may be fitted each side of the hatchways in lieu of tie plates, but if the beams are made of such additional strength laterally as not to require the support given by the said angle irons or tie plates, double angle irons of the above size fitted at the centre line, from opening to opening, may be substituted. All hatchways and mast holes are to be properly framed to receive half beams where required, and the latter to have mast partners at each tier of beams (except at orlop beams), the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than three times the diameter of the masts ; these plates to be well riveted to each other, and to the beams, and angle iron carlings, and at the decks where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and riveted to the plate round the mast hole. The mast holes, skylights, and companions must be properly secured to the satisfaction of the Surveyors. Where wood coamings are fitted, plates are to be riveted to the beams to which the deck ends are to be fastened.

BUTT STRAPS.—Butt straps in all cases, except those of floor plates (*see Section* 13) to be one-sixteenth of an inch thicker than the plates they connect, and to be fitted with the fibre of the iron in the same direction as that of the plates, and riveted as per Section 4.

NOTES TO TABLE H.—*continued.*

BUTT PLATES OF OUTSIDE PLANKING.—The plates to which the butts of the outside planking are to be secured, must be of the breadth of the planks, and extend from frame to frame, efficiently riveted thereto, and of the thickness given in Table, but on the bows and quarters or wherever else the plank ends may have a tendency to strain off, they are to be one-eighth of an inch thicker than therein prescribed.

RIVETS AND RIVETING.—The rivets to be of the best quality, and to be of the diameter as per Table, the rivet holes to be regularly and equally spaced, and carefully punched opposite each other in the adjoining parts, from the faying surfaces in the laps, lining pieces, butt straps, and frames, and to be countersunk where required, the rivets not to be nearer to the butts or edges of the plating, lining pieces to butts, or of any angle iron, than a space equal to their own diameter, and not to be further apart from centre to centre than five times their diameter, or nearer than four times their diameter from centre to centre, and to be spaced through the frames and outside plating, and in reversed angle iron a distance equal to nine times their diameter from centre to centre. All butts of iron plating, excepting those of poops and top-gallant forecastles, to be at least double riveted, and a space equal to twice the diameter of the rivets to be between each row ; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

GARBOARD STRAKES.—The garboard strakes not to be less than two-thirds the depth of the keel prescribed in Table, and properly rabbeted into it, to be fitted closely to the iron keel plate, and to be of sufficient width. The butts of the garboard strakes to have not less than four feet six inches shift from the butts of the garboard strake on the opposite side of the vessel, nor less than the same shift clear of the keel scarph. For bolting, *see Section* 33.

PLANKING.—The planking to be thoroughly seasoned, quite free from sap, wane, or other defects, to be wrought with the heart side to the frames, and with not less than three strakes between the butts, without step butting, and with not less than six feet shifts ; the garboard strakes to be shifted and of the thickness given in *Section* 7 ; the bottom planking is not to be less in thickness than prescribed in Table, from the garboard strakes up to within a fifth of the depth of hold set down below the upper deck stringer plate, from thence to the plankshеer to be in thickness as prescribed in Table for topsides ; or, if preferred, the bottom planking may retain its thickness up to within a fourth of the depth of the hold set down below the upper deck stringer plate, and from thence to the plankshеer be gradually diminished in thickness to that prescribed in Table for topsides ; the thickness of the wood sheerstrakes may be the thickness of the iron sheerstrake they cover less than that prescribed by Table. Outside planks (except the garboard strakes) are not to be more than twelve inches broad ; they are to be fitted quite close to the frames and plates, and to each other at their inner edges, and wrought with proper seams outside in proportion to their thickness ; the hood-ends may be reduced one-fifth from the thickness given in Table, at the stem or stern-post, and one-third at the buttock. The caulking edge of the keel seam, and hood-end seams of the planking at the stem and stern-post, need not exceed from two and a half inches to four inches, in proportion to the tonnage of the vessel ; which can be arranged by trimming the back rabbet from the bearding line as required, so as not to unnecessarily reduce the keel, stem, and stern-post. Furrens or pads are in no case to be used.

DECKS.—The flat of all decks to be of good quality, properly seasoned, free from sap and objectionable knots, the thickness and fastenings as per Table. The upper deck plank to be fastened by screw bolts from the upper side with nuts at the under side of the angle irons of the beams and to the tie plates, *see Section* 29. The bolts must be properly sunk, with oakum and white lead under their heads, and be carefully covered over with turned dowels, their fibre in the same direction as the deck plank, and bedded in white lead, marine glue, or other suitable composition. When the deck planks are six inches in width and under, single fastening will be sufficient ; but when they are above six inches and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt ; and planks exceeding eight inches in width must be double fastened with nut and screw bolts. If the deck is of Teak it may be one-eighth less in thickness than prescribed in the Table. Upper decks must be renewed when worn in thickness as follows, viz. :—When a deck originally 4 inches thick is worn to 3 inches ; $3\frac{1}{4}$ inchs to $2\frac{3}{4}$ inches ; 3 inches to $2\frac{1}{2}$ inches.

CEMENT.—All vessels to be efficiently cemented in the bottom to the upper part of the bilges, care to be taken to have proper water courses above the cement all fore and aft.

WINDLASS.—The diameter of main piece of windlasses in Steam Ships may be seven-eighths of that required in the Table, provided always the body of the windlass be not of unusual length.

Lloyd's Register of Shipping, London, 24th February, 1870.

COMPOSITE VESSELS. TABLE I.

Exhibiting the Number of Years to be assigned to the different descriptions of Timber used in Composite Vessels.

The same to be of good quality, properly seasoned, and free from defect.

	TIMBER.	KEEL.	Stem, Sternpost, Apron, Inner Sternpost, Deadwood, Knightheads and Hawse Timbers.	Floors, Wood Frames and Ceilings upon them; Beams and Keelsons.	OUTSIDE PLANK.		Upper Deck Waterway, Spirketting Planksheer, and Roughtree Timbers.	RUDDER, WINDLASS, and PALL BITT. — Main Pieces.
					From Top of Keel to Two-fifths the Depth of Hold (*a*)	From Two-fifths the Depth of Hold (*a*) to Gunwale.		
1	East India Teak	16	16	16	16	16	16	16
2	Greenheart, Morra, Iron Bark	14	12	12	14	12	12	14
3	(*b*) Live Oak, English, African, French, Adriatic, Italian, Spanish, and Portuguese Oaks	14	12	12	12	12	12	14
4	Pitch Pine, Oregon and Huon Pine, Larch, Hackmatack, Cowdie or Kaurie Pine ..	9	9	9	12	10	10	—
5	(*b*) Northern Continental Oak	12	9	9	12	10	10	9
6	(*b*) American White Oak	10	7	7	10	8	7	7
7	Dantzic, Memel, Riga, and American Red Pine	9	8	8	10	9	10	—
8	American Rock Elm	16	—	8	16	6	6	—
9	(*c*) English and French Elm, and Beech	16	—	—	16	—	—	—
10	Spruce Fir, Swedish and Norway Red Pine	—	—	—	8	8	—	—

(*a*) That is, two-fifths the depth of hold taken from the top of floors to the top of upper or tonnage deck beams, set up from the keel plate, in midships; which height is not to be exceeded fore and aft on a straight line.

(*b*) Live Oak, English, French, Adriatic, Italian, Spanish, and Portuguese Oak will be allowed to be used for stems, and for the bow and buttock planks where East India Teak would be liable to break in working, in vessels otherwise built of 16 years' timber material.

(*b*) Whenever any of the Oaks, or other woods of an acid nature are used, the best Hair Felt, Canvas, or other approved material, in addition to paint, is to be placed between them and the Iron Plates and Angle Irons.

(*c*) English and French Elm allowed for Garboard Strakes and Planking of flat of bottom in Ships of the 16 years' grade.

Where parties are desirous of using Woods not inserted in the Table, special application to be made to the Committee.

Lloyd's Register of Shipping, London, 29th May, 1879.

[SEE OVER.]

COMPOSITE VESSELS.

TABLE **K.**

Exhibiting the Sizes of Bolts, and Pintles of Rudder.

TONNAGE. (*See Section 23*).	Deadwood Keel (*b*) Stem (*a*) and Stern Post Bolts.	Bottom Plank, Scarphs of Keel, and Thwartship Garboard, Bolts.	Topside, Waterway, and Plankshear Bolts.	Chain Plate Bolts.	Pintles of Rudder.
50 and under 100	$\frac{7}{8}$	$\frac{10}{16}$	$\frac{9}{16}$	$\frac{13}{16}$	2
100 and under 200	1	$\frac{10}{16}$	$\frac{9}{16}$	$\frac{7}{8}$	$2\frac{1}{4}$
200 and under 300	$1\frac{1}{16}$	$\frac{12}{16}$	$\frac{10}{16}$	1	$2\frac{1}{2}$
300 and under 400	$1\frac{1}{16}$	$\frac{12}{16}$	$\frac{10}{16}$	$1\frac{1}{8}$	$2\frac{3}{4}$
400 and under 500	$1\frac{1}{16}$	$\frac{13}{16}$	$\frac{11}{16}$	$1\frac{1}{8}$	3
500 and under 600	$1\frac{1}{8}$	$\frac{13}{16}$	$\frac{11}{16}$	$1\frac{1}{8}$	$3\frac{1}{8}$
600 and under 700	$1\frac{1}{8}$	$\frac{14}{16}$	$\frac{12}{16}$	$1\frac{1}{4}$	$3\frac{1}{4}$
700 and under 800	$1\frac{1}{8}$	$\frac{14}{16}$	$\frac{12}{16}$	$1\frac{1}{4}$	$3\frac{1}{2}$
800 and under 900	$1\frac{3}{16}$	$\frac{15}{16}$	$\frac{13}{16}$	$1\frac{1}{4}$	$3\frac{1}{2}$
900 and under 1000	$1\frac{3}{16}$	$\frac{15}{16}$	$\frac{13}{16}$	$1\frac{3}{8}$	$3\frac{5}{8}$
1000 and under 1200	$1\frac{1}{4}$	1	$\frac{14}{16}$	$1\frac{3}{8}$	$3\frac{5}{8}$
1200 and under 1500	$1\frac{5}{16}$	1	$\frac{14}{16}$	$1\frac{3}{8}$	$3\frac{3}{4}$
1500 and under 2000	$1\frac{6}{16}$	$1\frac{1}{16}$	$\frac{15}{16}$	$1\frac{1}{2}$	$3\frac{7}{8}$
2000 and under 2500	$1\frac{7}{16}$	$1\frac{2}{16}$	1	$1\frac{1}{2}$	4
2500 and under 3000	$1\frac{8}{16}$	$1\frac{2}{16}$	1	$1\frac{5}{8}$	$4\frac{1}{8}$
3000 and under 3500	$1\frac{8}{16}$	$1\frac{3}{16}$	$1\frac{1}{16}$	$1\frac{3}{4}$	$4\frac{1}{8}$

TONS ..... (*See Section 23*).	under 150	150 and under 500	500 and under 1000	1000 and under 2000	2000 and under 3000
(*a*) Number of Bolts in Scarphs of Keels.	6	7	8	9	10

The length of the keel scarphs to be five times the mean of the siding and moulding of the keel.

(*a*) Stem Scarphs are not to be less than seven-tenths the length of the Keel Scarphs, and all Scarphs are to be Tabled.

BOLTS. 33.—The bolts to be not less than the sizes given in Table, the garboard strakes to be cross-bolted from side to side, with bolts not exceeding four feet six inches apart.

(*b*) The wood keel to have a vertical bolt through the keel plate between each frame. The stem, stern-post, deadwood, and remainder of the keel, to be through fastened in all cases, and the bolts spaced as in the keel. The screw pointed bolts for fastening the planking when less than five inches thick to be of such form under the heads, as will prevent them from turning, their heads to be once and three-quarters the diameter of the bolts, and two-fifths their diameter in thickness, the nuts in all cases to be of the same description of metal as the bolts they are applied to, and to be in thickness equal to their diameter, and not to have less substance than three-eighths the diameter of the bolts in any part, whatever the form may be, hexagon form being preferred. All outside planks ten inches broad and above, to be double fastened; eight inches-and-a-half and under ten inches, double and single fastened alternately; and under eight inches-and-a-half single fastened; and all butts to be double fastened. The bolt holes in the outside planking to be enlarged with a dowelling machine for the bolt heads, which in the bottom up to within one-fifth the depth of hold set down below the upper deck stringer plate are to be sunk within the surface of the planking one inch and a quarter, when dowels are intended to be used; from thence to the plankseer they need not be sunk more than three-quarters of an inch; the bolts to be properly driven with oakum and white lead, putty, marine glue, or other suitable composition under their heads, and in the bottom they are to be carefully covered (after the seams of the bottom are all caulked) with turned well seasoned wood dowels, the fibre of which must be in the same direction as the planking, and be driven with white lead, marine glue, or any other approved composition. Where copper or yellow metal bolts are used, the sinking of them within the surface of the planking to be optional to the above extent.

Lloyd's Register of Shipping, London, 24th February, 1870.

FORM OF REPORT

FORM No. 1 FOR WOOD SHIPS.—FORM OF THE REPORT OF ORIGINAL SURVEY.

No. —— Survey held at ———— Date, First survey ———— Last survey ———— 18—

on the ———— Master ————

Official Number ————	Tonnage of houses on deck ————	Register tonnage, cut on beam———
Tonnage under tonnage deck ———	Ditto of forecastle ————	Engine-room ————
Ditto of spar dk. or awning dk. ———	Gross tonnage ————	Register tonnage, as a steamer, cut on the beam————
Ditto of poop, or raised qr. dk.———	Crew space, as per Rule ————	

Built at ——— When built ——— Launched ——— By whom built ——— Owners ———

Port belonging to——— Destined voyage——— If Surveyed while Building, Afloat, or in Dry Dock———

Length as per Section 39..... Feet. Inches.	Round of Beam .....Feet. Inches.	Depth, Moulded .....Feet. Inches.
Length of Keel.....	Depth of Hold.....	No. of Decks with flat laid.....
Extreme breadth Outside	Depth from limber-strakes to under side of lower deck beam..	No. of Tiers of Beams.

SCANTLINGS OF TIMBER.	IN SHIP.			REQUIRED PER RULE, OR AS APPROVED.		
	Sided.	Moulded.		Sided.	Moulded.	
		Middle.	Ends.		Middle.	Ends.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Timber and space						
Floors						
1st Foothooks						
2nd Ditto						
3rd Ditto						
Top Timbers.....						
Deck Beams No.— { Average Space.						
Dk. Beams, length amidships						
Hold Beams No.— { Average Space.						
Hold Bms., length amidships						
Keel						
Scarphs of Ditto						
Keelsons						
Scarphs of Ditto						

OUTSIDE PLANK.	Thickness.	
	In Ship.	Required per Rule, or as approved.
	Ins.	Ins.
Garboard Strakes...		
Garboard to Bilge...		
Bilge Planks		
Bilge to Wales		
Wales		
Topsides		
Sheerstrakes		
Planksheers		
Waterways—		
Upper Deck		
Lower Deck		
Do. faying surface against Timbers..		
Upper Deck		

Dimensions of Ship per Register.
length—breadth—depth—

INSIDE PLANK.	Thickness.	
	In Ship.	Required per Rule, or as approved.
	Ins.	Ins.
Limber Strakes ...		
Bilge Planks		
Ceiling in Flat.....		
Do. Bilge to Clamp		
Hold Beam Clamps		
Deck Beam Ditto...		
Ceiling 'twixt Dks.		
Hold Beam Shelfs..		
Deck Beam Ditto...		

SIZE OF BOLTS IN FASTENINGS, DISTINGUISHING WHETHER COPPER, YELLOW METAL, OR IRON; ALSO OF TREENAILS.

	Copper or YM. in Ship.	Iron in Ship.	Size required per Rule.
	Ins.	Ins.	Ins.
Heel-Knee, and Deadwood abaft...			
Scarphs of Keel, No.			
Keelson Bolts through Keel at each Floor			
Bolts through Heels of Timbers against Deadwood			
Frame Bolts			
Transoms and Throats of Hooks..			
Arms of Hooks			
Through Bilge & Limber Strakes			
Thickstuff over Double Floors ...			

	Copper or YM. in Ship.	Iron in Ship.	Size required per Rule.
	Ins.	Ins.	Ins.
Butt End Bolts			
Short Bolts in Ceiling			
Pintles of the Rudder			
Hold Beam Bolts in { Waterway			
Knees			
Shelf or Clamp ...			
Deck Beam Bolts in { Waterway			
Knees			
Shelf or Clamp ...			
Nails or Bolts in Flat of Deck...			
Treenails ——— Inches ———			

TIMBERING.—The space between the Floor Timbers and Lower Foothooks is —— inches.
The space between the Top Timbers is —— inches.
The Floors consist of ——— The First Foothooks of ———
The Second Foothooks of ——— The Third Foothooks and Top Timbers of ———
The Main Keelson is ——— and —— free from all defects.
The Shifts of the First and Second Foothooks are not less than ——
(The Rider Keelson is ———)

[*N.B.—When less than prescribed by the Rules, state how many.*]

The Transoms, Knightheads, Hawse Timbers, and Aprons of ——— Deadwood, of ——— and —— The Stem and Stern Post of ——— free from all defects.
The Deck and Hold Beams of —— Breasthooks of —— Knees of —— The Main piece of Rudder of ——— Windlass of ——— (The Keel of ———)
The rest of the Shifts of the Frame are —— The Frame is —— squared from First Foothook heads upwards, and —— free from sap, and from thence downwards, the Frame is ——
The —— Frames are —— bolted together to the gunwale.

[*N.B.—If not, state how bolted.*]

The butts of the Timbers are —— close together; their thickness not less than —— of the entire moulding at that place.
The Frame is —— chocked with —— Butt at each end of the chock.

PLANKING OUTSIDE.—From the top of the keel to two-fifths the depth of Hold, the Plank is———
From the above-named height to the Wales ———
The Wales and Blackstrakes ——— The Topsides and Sheerstrakes ———
The Spirketting and Planksheers ——— The Waterways { Upper Deck ——— / Lower Deck ———
The Decks ——— State of ———
The Shifts of the Planking are not less than —— feet —— inches.

[*N.B.—If less than prescribed by the Rule, state whether general or partial, and if partial, in what part of the Ship.*]

The Planking is wrought ——— between, *and without step-butting.*

PLANKING INSIDE.—The Limber-strakes and Bilge-strakes are ———
The Ceiling, Lower Hold, and between Decks ——— Shelf Pieces and Clamps ———

FASTENINGS.—To Hold Beams ——— Deck beams ———
Number of Breasthooks ——— Pointers ——— Crutches ———
Butt End Bolts are of ——— in the Bottom ——— Bolts in each Butt End ——— through and clenched. Bilge and Limber Strakes ——— bolted through and clenched.
Treenails of ——— How made ——— Thickstuff over Double Floors ——— bolted through and clenched. General quality of Workmanship ———

We certify that the above is a correct description of the several particulars therein given,

Builder's Signature ——— *Surveyor's Signature* ———

Surveyor to Lloyd's Register of British and Foreign Shipping.

EQUIPMENT TONNAGE———— ANCHORS.

No. of Certif.	Anchors.	Weight, Ex. Stock.			Weight of Stock.			Test, per Certificate.				Weight, Required by Rule.			Description of Anchor.	Makers.	Where and when tested and Supt.
		Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.	Tons.	qrs.	lbs.			
	1st Bower ...														*If Patent state name of Patentee.*		
	2nd ,, ...																
	3rd ,, ...																
	Collective wght																
	Stream.....																
	Kedge																
	2nd Kedge ...																

CHAIN CABLES. HAWSERS AND WARPS.

No. of Certificate.	Fathoms	Size.	Test per Certif. Tons.	Weight of Chain Cable. Supplied.	Weight of Chain Cable. Per Rule.	Fath'ms and Size per Rule.	Description.	Makers of Cables.	Where and when tested and Superintendent.	Material.	Size.	Fathoms	Breaking Test of Steel Wire Towline.	Fathoms and Size per Rule.
										Towline				
										Hawser				
										Warp				
Iron Stream Chain or Steel Wire...														

Masts, Yards, &c. are in ——— condition, and sufficient in size and length.

Standing and Running Rigging ———— sufficient in size and ———— in quality.

Sails ———— Suit of ———— Sails, and the following spare sails ————

Boats ———— Windlass, present state is ————Capstan ————Rudder ———— Pumps ————

Scuppers, &c.—What arrangements are there beyond the scuppers on deck, for clearing upper deck of water, in case of a sea coming on board ?————

Cargo Hatchways.—How formed ? ———— State size ———— If of extraordinary size, state how framed and secured ? ———— What arrangements for shifting beams ? ————

Hatches, themselves, whether strong and efficient ? —— Main Hatchways.—State size ——

Order for Special Survey, No. — Date ————
Order for Ordinary Survey, No. — Date ————
No.——in Builder's Yard.

Dates of Surveys held while building, as per Section 35.

1st. When the Frame is completed ————
2nd. When the Beams are put in, &c. ———
3rd. When completed, and before the plank be painted or payed ———

General Remarks.

Present condition of Caulking of Bottom ——— Deck ——— and Waterways ———
If Sheathed, Doubled, Felted, Coppered, or Yellow Metalled ——— When last done ———
I am of opinion this Vessel should be Classed ———

The amount of the Entry Fee.....£ : :
Special .....£ : :
Certificate ...£ : :
(*Travelling Expenses, if any* £——.)

Fees applied for, ————18—
Received by me, ————18—
————————

————————
Surveyor to Lloyd's Register of British and Foreign Shipping.

Committee's Minute————18— *Character assigned* ———

FORM OF REPORT No. 1A.

1 OR 2 DECKS., R. Q. DK., AND PT. AWNG. DK.

IRON OR STEEL STEAMER.

State if Report is also sent on the Machinery of the Vessel———

Date of Completion of Report——— Port of——— No.—— Survey held at——— Date, First survey——— Last survey———18— on the———Rig———

Tonnage under tonnage deck ———
Ditto of poop ———
Ditto of raised quarter deck or break———
Ditto of bridge house ———
Ditto of forecastle ———
Ditto of houses on deck ———
Ditto of excess of hatchways———
Ditto above crown of engine room ———
Gross tonnage ———
Less crew space———
Less above crown of engine room ———
Tonnage for fees
Less engine room ———
Less navigation spaces ———
Register tonnage as cut on beam———

Master—— Year of Appointment { (1) As master in service of owner of present vessel..... 18— (2) As master of this vessel ..... 18—

ONE OR TWO DECKED VESSEL.

CLASS———	Feet.
Half breadth (moulded)	
Depth from upper part of keel to top of main deck beams	
Girth of half midship frame (as per rule)	
1st Number.....	
Length	
2nd Number	
Proportions, breadths to length ...	
Depths to length, main deck to top of keel	

Built at ———
When built——— Launched———
By whom built ———
Owners———
Managers———
(Where necessary to be entered in Reg. Book.)
Residence ———
Port belonging to———

Destined voyage——— If surveyed while building, afloat, or in dry dock———

	Feet.	Inches.		Horse.	
Length on deck, as per rule.....			Power of Engines		No. of decks with Flat laid ———
Breadth, Moulded					No. of Tiers of Beams———
Depth, top of Floors to Main Deck Beams.....					

Dimensions of Ship per Register, length.———breadth———depth———. Moulded depth, ft.——ins.——. Round up of Beam———inches.

FRAMING.	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Frame, Angles, Z, ⊏ or L Bars, for ⅜ length amidships						
Do. for ⅛ at each end						
Do. in way of Double Bottoms at Solid Floors						
„ „ at intermdt. Bkts.						
Distance of Frames from moulding-edge to moulding-edge, all fore and aft						
Reversed Frame, Angles						
Deep Framing, depth of girder						
Floors, depth and thickness of Floor Plate at mid-line for ⅜ length amidships						
„ in way of Engines and Boilers						
„ thickness at the ends of vessel						
„ depth at ¾ the half breadth, as per Rule						
„ height extended at the Bilges.....						
Floors and Brackets, in Cell Double Bottoms...						
„ „ distance apart						
Centre Girder, in double bottom, depth and thickness						
„ Angles, Top						
„ „ Bottom						
Side Girders, number and thickness.....						
„ Angles						
Margin Plate, depth (exclusive of flange) and thickness						
„ Angles						
Inner Bottom Plating, breadth and thickness of Middle Line Strake						
„ „ thickness in engine and boiler space						
„ „ „ remainder in holds						
Beams, Main and Raised Quarter Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Lower Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge.....						
„ Average space						
Hold, Plate or Tee Bulb						
Beams, Angles on upper edge.....						
„ Average space						
Beams, Poop Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge.....						
„ Average space						
Beams, Bridge Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Forecastle Deck, Angle, Bulb Angle Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Pillars, in 'tween Decks, Size and Spacing						
„ Hold „ „						
„ Quarter, 'tween Dks., Size and Spacing						
„ „ in Hold „ „						
Web Frames, in Fore Body, No. and Spacing						
„ „ „ Breadth and Thickness						
„ No. of Side Stringers „ „						
Web Frames, in E. & B. Space, No. and Spacing						
„ „ „ Brdth. and Thickness						
Web Frames, in After Body, No. and Spacing						
„ „ Breadth and Thickness						
„ No. of Side Stringers „ „						
„ Size of Angles or Tee Bars to Web Frames						
Bracket Plates to Stringers between Web Frames, Depth and Thickness.....						

FORGINGS AND CASTINGS.	Inches in Ship.	Inches per rule or as Approved.
Keel, Bar or Side Plates, depth and thickness		
Stem, moulding and thickness		
Stern-post for Rudder, do. do.....		
„ for Propeller.....		
Main piece of Rudder, diameter at head		
„ do. at heel		

Rudder, how constructed——. Can the Rudder be unshipped afloat ?——

KEELSONS AND STRINGERS.	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Centre Line Keelson, Vertical Plate above floors, Through Plate, or Intercostal Plate						
„ Rider Plate						
„ Bulb Plate to Intercostal Keelson						
„ Horizontal Plates on Floors						
„ Angles						
Side Keelson, Angles						
„ Bulb or Plate above floors for——lng.						
„ Intercostal Plate for————length						
„ Attached to outside plating with Angle						
Bilge Keelson, Angles						
„ Bulb or Plate above floors for——lng.						
„ Intercostal Plate for————length						
„ Attached to outside plating with Angle						
Bilge Stringer, Angles						
„ Bulb Plate for————length						
„ Intercostal Plate for————length						
„ Attached to outside plating with Angle						
Side Stringer, Angles						
„ Bulb or Intercostal Plate for——lng.						
Main and Raised Quarter Deck Stringer Plate, breadth and thickness						
„ Angle on ditto						
„ Tie Plates fore and aft, outside hatchways						

	In Ship.		Per Rule or as Approved.	
	Inches.	16ths or 20ths.	Inches.	16ths or 20ths.
Main Diagonal Tie Plates on Beams, No. of Pairs				
„ Main Deck* Iron or Steel for——lng.				
„ R. Q. Dk* Iron or Steel for				
„ Wood Deck. Material and thickness...				
Lower Deck Stringer Plate, breadth and thickness				
„ Angles on ditto, No.————				
„ Tie Plates, outside Hatchways				
„ Deck* Material and thickness				
Hold Stringer Plate				
„ Angles on ditto, No.————				
Poop Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck, Material and thickness				
Bridge Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck, Material and thickness				
Forecastle Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck, Material and thickness				

* If Iron or Steel Deck, state if whole or part, and if wood deck is laid thereon.

BULKHEADS.	Number. In Vessel.	Number. Per Rule.	Thickness.	STIFFENERS. Horizontal.	STIFFENERS. Vertical.	STIFFENERS. Spacing.	Single or Double Frames.	Height up.
			16ths or 20ths.	Inches.	Inches.	Inches.		
W. T. Bulkheads								
Partition „								
Longitudinal „								

Are the outside Plates doubled two spaces of Frames in length? ————————

PLATING.

RIVETING.

STRAKES.	AS IN SHIP. Amidships. Brdth.	Amidships. Thickness.	Forwrd Thickness.	Aft. Thickness.	PER RULE OR AS APPROVED. Amidship. Brdth.	Amidship. Thickness.	EDGES. Single or Dble.	Brdth of Lap.	Rivets. Diam.	Rivets. Spac'g cr. to cr.	BUTTS. D'ble or Treble & for what Length.	Rivets. Diam.	Rivets. Spac'g cr. to cr.	Straps. Brdth	Straps. Thickness.	If Lapped. Brdth	If Lapped. For what Lng.
	Inches.	16ths or 20ths.	16ths or 20ths.	16ths or 20ths.	Inches.	16ths or 20ths.		Inches.	Inches.	Inches.		Inches.	Inches.	Inches.	16ths or 20ths.	Inches.	Feet.
Flat Plate Keel..... (*If Bar Keel, state Riveting.*)																	
Garboard or A Strake																	
State actual thickness in way of Dble. Bottom. B „																	
C „																	
D „																	
E „																	
F „																	
G „																	
H „																	
J „																	
K „																	
L „																	
M „																	
N „																	
O „																	
P „																	
Doubling of Flat Plate Keel.....																	
Length and thickness of Bilges																	
Length and thickness of Sheerstrakes																	
Length and thickness of Strake below..																	
Poop Sides																	
Raised Quarter Deck Sides																	
Bridge Sides																	
Forecastle Sides																	
Lengths of Plating...																	

Manufacturer's name or trade mark of the Iron or Steel (state process of manufacture of steel) used for Frames, Beams, Keelsons, Tie and Stringer Plates, Outside Plating, &c.? ————

Main Stringer Plate, Butts, treble riveted for————length amidship; Straps single, double or overlapped for————length amidship; Butts of Bilge and Side Stringers, and Tie Plates, treble or double riveted ?————; Inner Bottom Plating, riveting of Edges————Butts————; Centre Girder Butts,————riveted; Keelson Butts,————riveted; Frames, riveted through Plates with————in. Rivets, about————apart; Rivets, state whether of Iron or Steel————

Frames extend in one length from——to——Reversed Frames on floors and frames extend from——

MASTS, SPARS, &C.

	Material.	Total Length.	Diameter and Thickness. At Partners.	Heel.	Hounds.	Head.	No. of Plates in round.	Angles. No.	Size	Riveting. Seams.	Butts.
Lower Masts { Fore											
Main.....											
Mizen											
Bowsprit											

Topmasts, Yards and remainder of Spars——— Rigging, Material and Size, Shrouds———. Stays——

Sails.—Suit of———Sails, and the following spare sails————

EQUIPMENT No.——LETTER——. ANCHORS. Tonnage for Trawlers——U. Deck.

No. of Cert.	Anchors.	Weight, Ex. Stock. Cwts.	qrs.	lbs.	Weight of Stock. Cwts.	qrs.	lbs.	Test, per Cert. Tons.	cwts.	qrs.	lbs.	Weight req. by Rule. Cwts.	qrs.	lbs.	Description of Anchor.	Makers.	Where and when tested and Superintendent.
	1st Bower														*If Patent state name of Patentee.*		
	2nd „																
	3rd „																
	Collective weight																
	Stream																
	Kedge																
	2nd Kedge																

CHAIN CABLES.

HAWSERS AND WARPS.

Number of Certificate.	Faths.	Size.	Test per Cert. Tons.	Weight of Chain Cable. Supplied	Per Rule	Fthms. & Size Per Rule	Description.	Makers of Cables.	When and where tested and Superintendent.	Material.	Faths	Size.	Beaking test of Steel Wire Towline.	Fthms. & Size Per Rule
										Towline				
										Hawser				
										Warp				
Iron Stream Chain or Steel Wire														

Boats————Pumps, Number————Diameter of Barrel and Tail Pipe————Windlass is————

Capstan———Engine Room Skylights.—How constructed ?————What arrangements for deadlights in bad weather ?————Coal Bunker Openings.—How constructed ?——How are lids secured ?——

Height above deck ?—Number of Scuppers, and number and dimensions of Freeing Ports, &c.————

Ceiling in Holds, thickness and material————Ceiling 'tween Decks, thickness and material————

Cargo Hatchways.—How formed ?———Hatches, if strong and efficient ?———State size No. 1 Hatch (forward)——No. 2 Hatch——No. 3 Hatch——No. 4 Hatch——Number of Web Plates, Shifting Beams, and Fore and Afters to each Hatch————No. of Breasthooks——No. of Crutches——

Bulwarks, height above deck and description———Main Rail, material and size————.

The above is a correct description.

Builder's Signature (here only)———— *Surveyor's Signature,*————

Surveyor to Lloyd's Register of British and Foreign Shipping.

CORRESPONDENCE.—State dates and initals of letters respecting this case (*Reference should be made to any correspondence connected with the case*)———

WORKMANSHIP.—Are the butts of plating planed or otherwise fitted ?———
Is the riveted work properly closed ?———
Are the liners between the frames and plates solid single pieces ?——Do the holes for riveting plate to frames, butt straps, or plate to plate, &c., conform well to each other ?——Are the rivet holes well and sufficiently countersunk in the plate and punched from the faying surfaces ?——Do any rivets break into or through the seams or butts of the plating ?——
Are the butts of Plating, Stringers, &c., properly shifted and strapped ?——

GENERAL REMARKS. *(State quality of Workmanship, &c.)*

[*The Surveyor should state the Number of Report and Name of any Sister Vessel.*]

PARTICULARS FOR RECORD IN Register Book.—Length of Poop ——— ft., R.Q.D. or Break ——— ft., Bridge Deck —— ft., Forecastle —— ft. (in feet and tenths) where the Poop is on top of the R.Q.D., or when the Poop or R.Q.D. is joined to the B.D., this should be distinctly stated———— No. and Material of Decks (if Iron or Steel) and whether wholly or partially covered with wood, and No. of tiers of Beams (this information is to be given as it should appear in the Register Book)— Official No.——; Signal Letters—— How are the surfaces preserved from oxidation ? Inside ———— Outside ————

PARTICULARS OF WATER BALLAST.—State whether the Double bottom is constructed on the cellular system ————

Where fitted.	Length.	Water Capacity
	Feet.	Tons.
Double bottom, aft, ...		
Double bottom forward, ...		
Double bottom, under Engines and Boilers,.....		
Double bottom, if under Engines only, ...		
Double bottom, if under Boilers only,		

Where fitted.	Length.	Water Capacity.
	Feet.	Tons.
Fore peak tank, ...		
After peak tank, ...		
Midship deep tank, ...		
Other tanks, if fitted, ...		
(If necessary, furnish further information by sketch.)		

State whether the above have been tested as required by the Rules———.

Order for Special Survey No. ——
Date————
Order for Ordinary Survey No. ——
Date ————
No.—in Builder's Yard.

Dates of Surveys held while building, as per Section 18.

1st. On the several parts of the frame, when in place, and before the plating was wrought ————
2nd. On the plating during the process of riveting ——
3rd. When the beams were in and fastened, and before the decks were laid ——
4th. When the ship was complete, and before the plating was finally coated or cemented ——
5th. After the ship was launched and equipped ———

Total No. of visits ———

The amount of the Entry Fee .....£ : :
Special .....£ : :
Certificate* .....£ : :
Travelling Expenses (if any).....£ : :

Fees applied for, ————18—
Received by me, ————18—
————————

**Certificate to be sent to*————

I am of opinion this Vessel should be classed ————
With, or without Freeboard, as condition of Class ————

Surveyor to Lloyd's Register of British and Foreign Shipping.

Committee's Minute ————————————
Character assigned ————————————

(*The Surveyors are requested not to write on or below the space for Committee's Minute.*)

FORM OF REPORT No. 1B.

3 DECKS. IRON OR STEEL STEAMER. No.——

State if Report is also sent on the Machinery of the Vessel——

Date of Completion of Report—— Port of—— Received at London Office—— Survey held at—— Date, first survey—— Last survey——18— on the—— Rig——

Tonnage under tonnage deck ——
Ditto between tonnage dk. & 3rd & 4th dk.——
Total under upper deck ——
Ditto of poop ——
Ditto of bridge house ——
Ditto of houses on deck ——
Ditto of forecastle ——
Ditto of excess of hatchways ——
Ditto above crown of engine room ——
Gross tonnage ——
Less crew space ——
Less above crown of engine room ——
Tonnage for fees ——
Less engine room ——
Less navigation spaces——
Register tonnage as cut on beam——

Master—— Year of Appointment { (1) As master in service of owner of present vessel..... 18— (2) As master of this vessel ..... 18—

THREE DECKED VESSEL.

CLASS——

	Feet.
Half breadth (moulded).....	
Depth from upper part of keel to top of upper deck beams	
Girth of half midship frame (as per rule).....	
deduct 7 feet...	
1st Number	
Length.....	
2nd Number	
Proportions, breadth to length.....	
Depth to length—upper deck to top of keel	
Main deck ditto	

Destined voyage—— If surveyed while building, afloat, or in dry dock——

Built at ——
When built—— Launched——
By whom built ——
Owners——
Managers——
(Where necessary to be entered in Reg. Book.)
Residence ——
Port belonging to——

	Feet.	Inches.
Length on deck, as per rule.....		
Breadth, Moulded		
Depth, top of Floors to Upper Deck Beams		
Ditto ditto Main Deck Beams ...		

Power of Engines ..... Horse.

No. of decks with flat laid ——
No. of Tiers of Beams ——

Dimensions of Ship per Register, length——breadth——depth—— Moulded depth, ft.—ins.—to upper deck. Round up of beam, upper deck——ins.

FRAMING.	In Ship. Inches.	In Ship. Inches.	In Ship. 16ths or 20ths.	Per Rule or as Approved. Inches.	Per Rule or as Approved. Inches.	Per Rule or as Approved. 16ths or 20ths.
Frame, Angles, or Z, ⊏ or ⊔ Bars for ¾ length amidships						
Do. for ⅓ at each end.....						
Do. in way of Double Bottoms at Solid Floors						
„ „ at intermdt. Bkts.						
Distance of Frames from moulding edge to moulding-edge all fore and aft						
Reversed Frame, Angles						
Deep Framing, depth of girder						
Floors, depth and thickness of Floor Plate at mid-line for ¾ length amidships.....						
„ in way of Engines and Boilers						
„ thickness at the ends of vessel						
„ depth at ¾ the half breadth, as per Rule						
„ height extended at the Bilges.....						
Floors and Brackets, in Cell Double Bottoms...						
„ „ Distance apart.....						
Centre Girder, in Double Bottom, depth and thickness						
„ Angles, Top						
„ „ Bottom						
Side Girders, number and thickness						
„ „ Angles						
Margin Plate, depth (exclusive of flange) and thickness						
„ „ Angles						
Inner Bottom Plating, breadth and thickness of Middle Line Strake						
„ „ thickness in engine and boiler space						
„ „ „ remainder in holds						
Beams, Upper Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						

	In Ship. Inches.	In Ship. Inches.	In Ship. 16ths or 20ths.	Per Rule or as Approved. Inches.	Per Rule or as Approved. Inches.	Per Rule or as Approved. 16ths or 20ths.
Beams, Middle Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Lower Deck, Single Angle, Bulb Angle Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space.....						
Beams, Hold or Orlop, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Poop Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Bridge Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space.....						
Beams, Forecastle Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Pillars, in 'tween decks, Size and Spacing						
„ „ Hold „ „						
„ Quarter'tween dks.„ „						
„ „ in Hold „ „						
Web-Frames, in Fore Body, No. and Spacing...						
„ „ „ breadth and thickness						
„ No. of Side Stringers „ „						
Web-frames, in E. & B. Space, No. and spacing						
„ „ „ brdth. & thicknss.						
Web-frames, in After Body, No. and spacing...						
„ „ „ breadth & thickness						
„ No. of Side Stringers „ „						
„ Size of Angles or Tee Bars to Web Frames						
Bracket Plates to Stringers between Web Frames, depth and thickness						

FORGINGS OR CASTINGS.	Inches in Ship.	Inches per rule or as Approved.
Keel, Bar, or Side Plates, depth and thickness		
Stem, moulding and thickness		
Stern-post for Rudder do. do.		
„ for Propeller		
Main piece of Rudder, diameter at head		
„ „ do. at heel		

Rudder, how constructed———
Can the Rudder be unshipped afloat?———

KEELSONS AND STRINGERS.	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Centre Line Keelson, Vertical Plate above floors, Through Plate, or Intercostal Plate						
„ Rider Plate						
„ Bulb Plate to Intercostal Keelson						
„ Horizontal Plates on Floors						
„ Angles						
Side Keelson, Angles						
„ Bulb or Plate above floors, for——lng.						
„ Intercostal Plate, for———length						
„ Attached to outside Plating with Angle						
Bilge Keelson, Angles						
„ Bulb or Plate above floors, for——lng.						
„ Intercostal Plate, for———length						
„ Attached to outside Plating with Angle						
Bilge Stringer, Angles						
„ Bulb Plate for———length						
„ Intercostal Plate for———length						
„ Attached to outside Plating with Angle						
Side Stringer, Angles						
„ Bulb or Intercostal Plate, for——lng.						
„ Attached to outside Plating with Angle						

	In Ship.		Per Rule or as Approved.	
	Inches.	16ths or 20ths.	Inches.	16ths. or 20ths.
Upper Deck Stringer Plates, br'dth & thickness				
„ Angle on ditto				
„ Tie Plates fore and aft, outside Hatchways				
„ Deck* Iron or Steel, for———lng.				
„ Wood Deck. Material and thicknss——				
Middle Deck Stringer Plate, br'dth & thickness				
„ Angles on ditto, No.——				
„ Tie Plates outside Hatchways				
„ Diagonal Tie Plates on Beams, No. of pairs——				
„ Deck* Iron or Steel, for———lng.				
„ Wood Deck. Material and thicknss——				
Lower Deck Stringer Plate, br'dth & thickness				
„ Angles on ditto, No.——				
„ Tie Plates, outside Hatchways				
„ Deck. Material and thickness——				
Hold or Orlop Stringer Plate, br'dth & thickness				
„ Angles on ditto, No.——				
„ Tie Plates outside Hatchways				
„ Deck. Material and thickness——				
Poop Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck. Material and thickness——				
Bridge Deck Stringer Plate, breadth & thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck. Material and thickness——				
Forecastle Deck Stringer Plate, brdth & thicknss				
„ Angle on ditto				
„ Tie Plates				
„ Deck. Material and thickness——				

* If Iron or Steel Deck, state if whole or part, and if Wood Deck is laid thereon.

BULKHEADS.	Number. In Vessel.	Number. Per Rule.	Thickness. 16ths or 20ths.	STIFFENERS. Horizontal. Inches.	STIFFENERS. Vertical. Inches.	STIFFENERS. Spacing. Inches.	Single or Double Frames.	Height up.
W. T. Bulkheads								
Partition „								
Longitudinal „								

Are the outside Plates doubled two spaces of Frames in length?———

PLATING.

RIVETING.

STRAKES.	AS IN SHIP. Amidship. Brdth. Inches.	Amidship. Thickness. 16ths or 20ths	Frward Thickness. 16ths or 20ths	Aft. Thickness. 16ths or 20ths	PER RULE OR AS APPROVED. Amidship. Brdth. Inches.	Amidship. Thickness. 16ths or 20ths	EDGES. Single or Dble.	Brdth of Lap. Inches.	Rivets. Diam. Inches.	Rivets. Spac'g cr. to cr. Inches.	BUTTS. Dble or Treble & for what Length.	Rivets. Diam. Inches.	Rivets. Spac'g cr. to cr. Inches.	Straps. Brdth Inches.	Straps. Thickness. Inches.	If Lapped. Brdth Inches.	If Lapped. For what Lngth Feet.
Flat Plate Keel																	
(*If Bar Keel, state Riveting.*)																	
Garboard or A Strike																	
State actual thickness in way of Double Bottom. B „																	
C „																	
D „																	
E „																	
F „																	
G „																	
H „																	
J „																	
K „																	
L „																	
M „																	
N „																	
O „																	
P „																	
Q „																	
R „																	
Doubling of Flat Plate Keel																	
Length and thickness of Bilges																	
Length and thickness of Sheerstrakes																	
Length and thickness of Strake below																	
Poop Sides																	
Bridge Sides																	
Forecastle Sides																	

Manufacturer's name or trade mark of the Iron or Steel (state process of manufacture of Steel) used for Frames, Floors, Beams, Keelsons, Tie, and Stringer Plates, Plating, &c. ?——

Upper Deck Stringer Plate, Butts, treble riveted for——length amidship; Straps, single, double or overlapped for——length amidship. Middle Deck Stringer Plate, Butts, treble riveted for——length amidship; Straps, single, double or overlapped for——length amidship. Butts of Bilge and Side Stringers and Tie Plates, treble or double riveted?———— Inner Bottom Plating, riveting of Edges—— Butts——Centre Girder Butts,——riveted. Keelson Butts,——riveted. Frames, riveted through Plates with——in. Rivets, about——apart. Rivets, state whether Iron or Steel——

Frames extended in one length from——to—— Reversed Frames on floors and frames extend from——

MASTS, SPARS, &C.

	Material.	Total Length.	Diameter and Thickness. At Partners.	Heel.	Hounds.	Head.	No. of Plates in round.	Angles. No.	Size.	Riveting. Seams.	Butts.
Lower Masts Fore											
Lower Masts Main											
Lower Masts Mizen											
Bowsprit											

Topmasts, Yards and Remainder of Spars————Rigging, Material and Size, Shrouds———— Stays————Sails.————Suit of————Sails, and the following spare sails————.

EQUIPMENT No.——LETTER——. ANCHORS.

No. of Cert.	Anchors.	Weight Ex. Stock. Cwts.	qrs.	lbs.	Weight of Stock. Cwts.	qrs.	lbs.	Test, per Cert. Tons.	cwts.	qrs.	lbs.	Weight req. by Rule. Cwts.	qrs.	lbs.	Description of Anchor.	Makers	Where and when tested and Superintendent.
	1st Bower														*If Patent state name of Patentee.*		
	2nd „																
	3rd „																
	Collective weight																
	Stream																
	Kedge																
	2nd Kedge																

CHAIN CABLES. HAWSERS AND WARPS.

Number of Certificate.	Faths.	Size.	Test per Cert. Tons.	Weight of Chain Cable. Supplied.	Per Rule.	Fthms. & Size. Per Rule	Descptn	Makers of Cables.	Where and when tested, and Superintendent.	Material.	Faths.	Size.	Breaking Test of Steel Wire Towline.	Fthms. & Size. Per Rule
										Towline				
										Hawser				
										Warp				
Iron Stream Chain or Steel Wire														

Boats——Pumps, Number——Diameter of Barrel and Tail Pipe——Windlass is——Capstan—— ——Engine Room Skylights.—How constructed ?——What arrangements for deadlights in bad weather ? ——Coal Bunker Openings.—How constructed ?——How are lids secured ?——Height above deck ?—— Number of Scuppers, and number and dimensions of Freeing Ports, &c.——Ceiling in Holds, thickness and material——Ceiling 'tween Decks, thickness and material——Cargo Hatchways.—How formed ?—— Hatches, if strong and efficient ?——State size No. 1 Hatch (Forward)——No. 2 Hatch——No. 3 Hatch——No. 4 Hatch——Number of Web Plates, Shifting Beams, and Fore and Afters to each Hatch——No. of Breasthooks——No. of Crutches——Bulwarks, height above deck and description—— Main Rail, material and size——. *The above is a correct description.*

Builder's Signature (here only)———— *Surveyor's Signature*————

Surveyor to Lloyd's Register of British and Foreign Shipping.

CORRESPONDENCE.—State dates and initials of letters respecting this case (*Reference should be made to any correspondence connected with this case*)————

WORKMANSHIP.—Are the butts of plating planed or otherwise fitted ?——Is the riveted work properly closed ?——Are the liners between the frames and plates solid single pieces ?——Do the holes for riveting plate to frames, butt straps, or plate to plate, &c., conform well to each other ?——Are the rivet holes well and sufficiently countersunk in the plate and punched from the faying surfaces ?——Do any rivets break into or through the seams or butts of the plating ?——Are the butts of Plating, Stringers, &c., properly shifted and strapped ?——

GENERAL REMARKS. (*State quality of Workmanship, &c.*)————

The Surveyor should state the Number of Report and Name of any Sister Vessel.

PARTICULARS FOR RECORD IN Register Book—Length of Poop —— ft., R.Q.D. or break —— ft. Bridge Deck—ft., Forecastle——ft. (in feet and tenths) when the Poop is joined to the B.D., this should be distinctly stated ——— No. and Material of Decks (if Iron or Steel) and whether wholly or partially covered with wood, and No. of tiers of Beams (this information is to be given as it should appear in the Register Book)—Official No.—— ; Signal Letters—— How are the surfaces preserved from oxidation ? Inside —— Outside ——

PARTICULARS OF WATER BALLAST.—State whether the Double bottom is constructed on the cellular system ————

Where fitted.	Length.	Water Capacity.	Where fitted.	Length.	Water Capacity.
	Feet.	Tons.		Feet.	Tons.
Double bottom, aft, ...			Fore peak tank, ...		
Double bottom, forward, ...			After peak tank, ...		
Double bottom, under Engines and Boilers, ...			Midship deep tank, ...		
Double bottom, if under Engines only, ...			Other tanks, if fitted, ...		
Double bottom, if under Boilers only, ...			(If necessary, furnish further information by sketch.).....		
			State whether the above have been tested as required by the Rules.		

Order for Special Survey No. —— Date ————— Order for Ordinary Survey No.—— Date ———— No.—in Builder's Yard.

Dates of Surveys held while building, as per Section 18.

1st. on the several parts of the frames, when in place, and before the plating was wrought ————
2nd. On the plating during the process of riveting ——
3rd. When the beams were in and fastened, and before the decks were laid ——
4th. When the ship was complete, and before the plating was finally coated or cemented ——
5th. After the ship was launched and equipped ———
Total No. of visits ———

The amount of the Entry Fee .....£ : :
Special Survey Fee ...£ : :
Travelling expenses (if any) .....£ : :

Fees applied for, ————18—
Received by me, ————18—
————————

Certificate to be sent to ————

I am of opinion this Vessel should be classed ————
With, or without Freeboard, as condition of Class ————

Surveyor to Lloyd's Register of British and Foreign Shipping.

Committee's Minute————————————
Character assigned————————————
(*The Surveyors are requested not to write on or below the space for Committee's Minute.*)

FORM OF REPORT No. 1C.

SPAR, or AWNING DK.

IRON OR STEEL STEAMER. No.——

State if Report is also sent on the Machinery of the Vessel———

Port of——— Date of Completion of Report——— Received at London Office——— Survey held at——— Date, First survey——— Last survey———18— On the——— Rig——

Tonnage under tonnage deck ———
Ditto between tonnage deck and 3rd, 4th, spar or awning deck ———
Total under upper deck ———
Ditto of poop ———
Ditto of bridge house ———
Ditto of forecastle ———
Ditto of houses on deck ———
Ditto of excess of hatchways———
Ditto above crown of engine room ———
Gross tonnage ———
Less crew space———
Less above crown of engine room ———
Tonnage for fees ———
Less engine room ———
Less navigation spaces ———
Register tonnage as cut on beam———

Master——Year of Appointment { (1) As master in service of owner of present vessel ..... 18—— (2) As master of this vessel..... 18——

SPAR, AWNING OR PART AWNING-DECKED VESSEL,
Or a Vessel having a continuous Shade Deck.
CLASS———

	Feet.
Half breadth (moulded)	———
Depth from upper part of keel to top of main deck beams	———
Girth of half midship frame (as per rule).....	———
1st Number	———
Length.....	———
2nd Number	———
Proportions, breadths to length	———
Depths to length, main deck to top of keel	———

Built at ———
When built——— Launched———
By whom built ———
Owners———
Managers———
(Where necessary to be entered in Reg. Book.)
Residence ———
Port belonging to———
Destined voyage——— If surveyed while building, afloat, or in dry dock———

	Feet.	Inches.
Length on deck, as per rule.....		
Breadth moulded		
Depth, top of Floors to Spar or Awning Deck Beams		
Ditto ditto Main Deck Beams.....		

Power of Engines ..... Horse.

No. of Decks with flat laid ———
No. of Tiers of Beams ———

Dimensions of Ship per Register, length——breadth——depth { ——Spar or Awn. Dk. ——Main Deck. Moulded depth, ft.——ins.——to main dk. { Round up of Beam, Main dk. ——ins.

FRAMING.	In Ship. Inches.	In Ship. Inches.	In Ship. 16ths or 20ths.	Per Rule or as Approved. Inches	Per Rule or as Approved. Inches.	Per Rule or as Approved. 16ths or 20ths.
Frame Angles, or Z, ⊏ or L Bars, for ⅔ length amidships						
Do. for ⅓ at each end						
Do. in way of Double Bottoms						
„ „ at intermdt. Bkts.						
Distance of Frames from moulding-edge to moulding-edge, all fore and aft						
Reversed Frame Angles						
Deep Framing, depth of Girder						
Floors, depth and thickness of Floor Plate at mid-line for ⅔ length amidships						
„ in way of Engines and Boilers						
„ thickness at the ends of vessels						
„ depth at ¾ the half breadth as per Rule						
„ height extended at the Bilges						
Floors and Brackets, in Cell Double Bottoms...						
„ „ distance apart						
Centre Girder, in Double bottom, depth and thickness						
„ „ Angles, Top						
„ „ „ Bottom						
Side Girders, number and thickness						
„ Angles						
Margin Plate, depth (exclusive of flange) and thickness						
„ Angles						
Inner Bottom Plating, breadth and thickness of Middle Line Strake						
„ „ thickness in Engine and Boiler space						
„ „ Remainder in Holds.....						
Beams, Spar or Awning Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Main Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						

	In Ship. Inches.	In Ship. Inches.	In Ship. 16ths or 20ths.	Per Rule or as Approved. Inches	Per Rule or as Approved. Inches.	Per Rule or as Approved. 16ths or 20ths.
Beams, Angles on upper edge						
„ Average space						
Beams, Lower Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge.....						
„ Average space						
Beams, Hold, or Orlop, Plate or Tee Bulb						
„ Angles on upper edge.....						
„ Average space						
Beams, Poop Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Bridge Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Forecastle Deck, Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Pillars, in 'tween Decks, Size and Spacing						
„ „ Hold „ „						
„ Quarter, 'tween Dks., „ „						
„ „ in Hold „ „						
Web Frames, in Fore Body, No. and Spacing ...						
„ „ „ breadth and thickness						
„ No. of Side Stringers „ „						
Web Frames in E. & B. Space, No. & Spacing...						
„ „ „ breadth & thickness...						
Web Frames, in After Body, No. and Spacing						
„ „ breadth and thickness.....						
„ No. of Side Stringers „ „						
„ Size of Angles or Tee Bars to Web Frames						
Bracket Plates to Stringers between Web Frames, depth and thickness						

FORGINGS AND CASTINGS.	Inches in Ship.	Inches per rule or as Approved.
Keel, Bar or Side Plates, depth and thickness...		
Stem, moulding and thickness		
Stern-post for Rudder do. do.		
„ „ for Propeller		
Main-piece of Rudder, diameter at head		
„ „ „ at heel		

Rudder, how constructed———
Can the Rudder be unshipped afloat?———

KEELSONS AND STRINGERS.	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Centre Line Keelson, Vertical Plate above floors, Through Plate, or Intercostal Plate						
„ Rider Plate						
„ Bulb Plate to Intercostal Keelson ...						
„ Horizontal Plates on Floors						
„ Angles						
Side Keelson, Angles						
„ Bulb or Plate above floors, for——lng.						
„ Intercostal Plate, for———length						
„ Attached to outside Plating with Angle						
Bilge Keelson, Angles						
„ Bulb or Plate above floors, for——lng.						
„ Intercostal Plate, for———length						
„ Attached to outside Plating with Angle						
Bilge Stringer Angles						
„ Bulb Plate, for———length						
„ Intercostal Plate, for———length						
„ Attached to outside Plating with Angle						
Side Stringer Angles						
„ Bulb or Intercostal Plate, for——lng.						
„ Attached to outside plating with Angle						

	In Ship.		Per Rule or as Approved.	
	Inches.	16ths or 20ths.	Inches.	16ths or 20ths.
Spar, or Awning Deck Stringer Plates, breadth and thickness				
„ Angle on ditto				
„ Tie Plates, fore and aft, outside Hatchways				
„ Diagonal Tie Plates, No. of pairs———				
„ Deck.* Iron or Steel, for———length				
„ Wood Deck. Material and thickness—				
Main Deck Stringer Plate, breadth and thickness				
„ Angles on ditto, No.———				
„ Tie Plates, outside Hatchways				
„ Diagonal Tie Plates, No. of pairs———				
„ Deck.* Iron or Steel, for———length				
„ Wood Deck. Material and thickness—				
Lower Deck Stringer Plates, breadth and thickness				
„ Angles on ditto, No.———				
„ Tie Plates, outside Hatchways				
„ Deck.* Material and thickness———				
Hold, or Orlop Stringer Plate, breadth and thickness				
„ Angles on ditto, No.———				
„ Tie Plates, outside Hatchways				
„ Deck. Material and thickness———				
Poop Deck Stringer Plate, breadth and thickness				
„ Angles on ditto				
„ Tie Plates				
„ Deck. Material and thickness———				
Bridge Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck. Material and thickness———				
Forecastle Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck. Material and thickness———				

* If Iron or Steel Deck, state if whole or part, and if Wood Deck is laid thereon.

BULKHEADS.	Number.		Thickness.	STIFFENERS.			Single or Double Frames.	Height up
	In Vessel.	Per Rule.		Horizontal.	Vertical.	Spacing.		
			16ths or 20ths.	Inches.	Inches.	Inches.		
W. T. Bulkheads								
Partition „								
Longitudinal „								

Are the outside Plates doubled two spaces of Frames in length? ———

PLATING.

STRAKES.	AS IN SHIP.				PER RULE OR AS APPROVED.		EDGES.				BUTTS.							
	Amidship.		Frward	Aft.	Amidship.		Single or Dble.	Brdth of Lap.	Rivets.		D'ble or Treble & for what Length.	Rivets.		Straps.		If Lapped.	
	Brdth.	Thickness.	Thickness.	Thickness.	Brdth.	Thickness.			Diam.	Spcng cr. to cr.		Diam.	Spcng cr. to cr.	Brdth	Thickness.	Brdth	For what Lng.
	Inches.	16ths or 20ths.	16ths or 20ths.	16ths or 20ths.	Inches.	16ths or 20ths.		Inches.	Inches.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Feet.
Flat Plate Keel..... (*If Bar Keel, state Riveting.*)																	
Garboard or A Strake																	
State actual thickness in way of Double Bottom. B „																	
C „																	
D „																	
E „																	
F „																	
G „																	
H „																	
J „																	
K „																	
L „																	
M „																	
N „																	
O „																	
P „																	
Q „																	
Doubling of Flat Plate Keel																	
Length and thickness of Bilges...																	
Length and thickness of Sheer-strakes..																	
Length and thickness of Strake below ...																	
Poop Sides.....																	
Bridge Sides.....																	
Forecastle Sides																	

RIVETING.

Manufacturer's name or trade mark of the Iron or Steel (state process of manufacture of Steel) used for Frames, Floors, Beams, Keelsons, Tie and Stringer Plates, Plating, &c. ?————

Spar or Awning Stringer Plate, Butts, treble riveted for————length amidship; Straps single, double or overlapped for————length amidship; Main Stringer Plate, Butts, treble riveted for———— length amidship; Straps, single, double or overlapped for————amidship; Butts of Bilge and Side Stringers and Tie Plates, treble or double riveted ?———; Inner Bottom Plating, riveting of Edges——— Butts————; Centre Girder Butts,————riveted; Keelson Butts,————riveted; Frames riveted through Plates with————in. Rivets, about————apart; Rivets, state whether Iron or Steel————

Frames extend in one length from——to——Reversed Frames on floors and frames extend from——

MASTS, SPARS, &C.

	Material.	Total Length.	Diameter and Thickness. At Partners.	Heel.	Hounds.	Head.	No. of Plates in round.	Angles. No.	Size.	Riveting. Seams.	Butts.
Lower Masts Fore											
Main											
Mizen											
Bowsprit———											

Topmasts, Yards and remainder of Spars——— Rigging, Material and Size, Shrouds———. Stays——

SAILS.—Suit of——Sails, and the following spare sails———

EQUIPMENT No.——LETTER——. ANCHORS.

No. of Cert.	Anchors.	Weight, Ex. Stock. Cwts.	qrs.	lbs.	Weight of Stock. Cwts.	qrs.	lbs.	Test, per Cert. Tons.	cwts.	qrs.	lbs.	Weight req. by Rule. Cwts.	qrs.	lbs.	Description of Anchor.	Makers.	Where and when tested and Superintendent.
	1st Bower														*If Patent state name of Patentee.*		
	2nd „																
	3rd „																
	Collective weight																
	Stream																
	Kedge																
	2nd Kedge																

CHAIN CABLES.

Number of Certificate.	Faths.	Size.	Test per Cert. Tons.	Weight of Chain Cable. Supplied.	Per Rule.	Fthms. & Size Per Rule	Description.	Makers of Cables.	When and where tested, and Superintendent.
Iron Stream Chain or Steel Wire									

HAWSERS AND WARPS.

Material	Faths.	Size.	Breaking test of Steel Wire Towline.	Fthms. & Size Per Rule
Towline				
Hawser				
Warp				

Boats————Pumps, Number———Diameter of Barrel and Tail Pipe———Windlass is———— Capstan———Engine Room Skylights.—How constructed ?————What arrangements for deadlights in bad weather ?————Coal Bunker Openings.—How constructed ?——How are lids secured ?—— Height above deck ?——Number of Scuppers, and number and dimensions of Freeing Ports, &c.———— Ceiling in Holds, thickness and material———Ceiling 'tween Decks, thickness and material———— Cargo Hatchways.—How formed ?———Hatches, if strong and efficient ?———State size No. 1 Hatch (Forward)——No. 2 Hatch——No. 3 Hatch——No. 4 Hatch——Number of Web Plates, Shifting Beams, and Fore and Afters to each Hatch————No. of Breasthooks——No. of Crutches—— Bulwarks, height above deck and description———Main Rail, material and size————.

The above is a correct description.

Builder's Signature (here only)———— *Surveyor's Signature*————

Surveyor to Lloyd's Register of British and Foreign Shipping.

CORRESPONDENCE.—State dates and initials of letters respecting this case————

[*Reference should be made to any correspondence connected with the case.*]

WORKMANSHIP.—Are the butts of plating planed or otherwise fitted ?——— Is the riveted work properly closed ?———— Are the liners between the frames and plates solid single pieces ?———— Do the holes for riveting plate to frames, butt straps, or plate to plate, &c., conform well to each other ?——— Are the rivet holes well and sufficiently countersunk in the plate and punched from the faying surfaces ?—— Do any rivets break into or through the seams or butts of plating ?—— Are the butts of Plating, Stringers, &c., properly shifted and strapped ?————

GENERAL REMARKS. *(State quality of Workmanship, &c.)*————

The Surveyor should state the number of Report and name of any Sister Vessel.

PARTICULARS FOR RECORD IN THE REGISTER BOOK—Length of Poop——ft., R.Q.D. or break——ft., Bridge Deck——ft., Forecastle——ft., (in feet and tenths) when the Poop is joined to the B.D., this should be distinctly stated————No. and Material of Decks (if Iron or steel) and whether wholly or partially covered with wood, and No. of tiers of Beams (this information is to be given as it should appear in the Register Book)———Official No.——; Signal Letters——How are the surfaces preserved from oxidation ? Inside———Outside————

PARTICULARS OF WATER BALLAST.

State whether the Double bottom is constructed on the cellular system————

Where fitted.	Length.	Water Capacity.	Where fitted.	Length.	Water Capacity
	Feet.	Tons.		Feet.	Tons.
Double bottom, aft			Fore peak tank.....		
Double bottom, forward			After peak tank		
Double bottom, under Engines and Boilers			Midship deep tank		
Double bottom, if under Engines only			Other tanks, if fitted		
Double bottom, under Boilers only			(If necessary, furnish further information by sketch)		
			State whether the above have been tested as required by the Rules———		

Order for Special Survey No. ——
Date————
Order for Ordinary Survey No.———
Date ————
No.—in Builder's Yard.

Dates of Surveys held while building, as per Section 18.

1st. On the several parts of the frame, when in place, and before the plating was wrought ————
2nd. On the plating during the process of riveting ——
3rd. When the beams were in and fastened, and before the decks were laid ——
4th. When the ship was complete, and before the plating was finally coated or cemented ——
5th. After the ship was launched and equipped ———
Total No. of visits ———

The amount of Entry Fee.....£ : :
Special Survey Fee...£ : :
Travelling expenses (if any) ...£ : :

Fees applied for, ————18—
Received by me, ————18—
————————

Certificate to be sent to————

I am of opinion this Vessel should be classed ———
With, or without Freeboard, as condition of Class ————

Surveyor to Lloyd's Register of British and Foreign Shipping.

Committee's Minute ————————————
Character Assigned ————————————

(*The Surveyors are requested not to write on or below the Space for Committee's Minute*).

LLOYD'S REGISTER OF SHIPPING.

FORM OF REPORT No. 1D.

SAILING VESSEL. IRON OR STEEL SAILING SHIP. No.——

Port of——— Date of Completion of Report——— Received at London Office——— Survey held at——— Date of First survey———Last survey———18—on the———Rig———

Tonnage under tonnage deck ———
Ditto of Poop———
Ditto of raised quarter-deck or break———
Ditto of bridge house ———
Ditto of forecastle———
Ditto of houses on deck ———
Ditto of excess of hatchways———
Gross tonnage ———
Less crew space ———
Tonnage for fees
Less navigation spaces ———
Register tonnage as cut on beam———

Master—— Year of Appointment { (1) As master in service of owner of present vessel ..... 18— (2) As master of this vessel ..... 18—

ONE OR TWO DECKED VESSEL.

CLASS———

	Feet.
Half breadth (moulded)	
Depth, from upper part of keel to top of upper deck beams.....	
Girth of half midship frame (as per rule)	
1st Number.....	
Length	
2nd Number	
Proportions, breadths to length ...	
Depths to length, upper deck to top of keel	

Built at ———
When built——— Launched———
By whom built ———
Owners———
Managers ———
(Where necessary to be entered in Reg. Book.)
Residence ———
Port belonging to ———

Destined voyage——— If surveyed while building, afloat, or in dry dock———

	Feet.	Inches.
Length on deck, as per rule.....		
Breadth moulded		
Depth, top of floors to upper deck beams		

No. of decks with flat laid ———
No. of Tiers of Beams ———

Dimensions of Ship per Register, length—— breadth—— depth——. Moulded depth ft.——ins.——. Round up of beam——ins.

FORGINGS AND CASTINGS.	Inches in Ship.	Inches per Rule or as Approved.
Keel, Bar or Side Plates, depth and thickness		
Stem, moulding and thickness		
Stern-Post, do. do.		
Main-Piece of Rudder, diameter at head		
„ „ „ at heel		

Rudder, how constructed———
Can the Rudder be unshipped afloat?———

FRAMING.	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Frame Angles, or Z Bars, for $\frac{3}{5}$ length amidships						
Do. for $\frac{1}{5}$ at each end						
Distance of Frames from moulding-edge to moulding-edge, all fore and aft						
Reversed Frame, Angles						
Deep Framing, depth of girder						
Floors, depth and thickness of Floor Plate at mid line for $\frac{3}{5}$ length amidships						
„ thickness at the ends of vessel						
„ depth at $\frac{3}{4}$ the half breadth, as per Rule						
„ height extended at the Bilges.....						
Beams, Main Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Lower Deck, Plate or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Hold, Plate or Tee Bulb						
„ Angles on upper edge.....						
„ Average space						

	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Beams, Poop Deck, Angle, Bulb Angle, Plate, or Tee Bulb						
„ Angles on upper edge						
„ Average space						
Beams, Bridge Deck, Angle, Bulb Angle, Plate, or Tee Bulb						
„ Angles on upper edge						
„ Average space.....						
Beams, Forecastle Deck, Single Angle, Bulb Angle, Plate or Tee Bulb						
„ Angles on upper edge.....						
„ Average space						
Pillars, in 'tween Decks. Size and Spacing ...						
„ „ Hold „ „ ...						
„ Quarter, 'tween Dks. „ „ ...						
„ „ in Holds „ „ ...						
Web-Frames, Number and Spacing						
„ „ breadth and thickness						
Number of Side Stringers, breadth and thickness						
Size of Angles or Tee Bars to Web-Frames.....						
Bracket Plates to Stringers between Web Frames, depth and thickness						

KEELSONS AND STRINGERS.	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Centre Line Keelson, Vertical Plate above floors, Through Plate, or Intercostal Plate						
„ Rider Plate						
„ Bulb Plate to Intercostal Keelson ...						
„ Horizontal Plates above floors						
„ Angles						

KEELSONS AND STRINGERS—*continued.*	In Ship.			Per Rule or as Approved.		
	Inches.	Inches.	16ths or 20ths.	Inches.	Inches.	16ths or 20ths.
Side Keelson, Angles						
„ Bulb or Plate above floors for——length						
„ Intercostal Plate for——length						
„ Attached to outside Plating with Angle						
Bilge Keelson, Angle						
„ Bulb above floors for——length						
„ Intercostal Plates for——length						
„ Attached to outside Plating with Angle						
Bilge Stringer, Angles						
„ Bulb Plate for——length						
„ Intercostal Plates for——length						
„ Attached to outside Plating with Angle						
Side Stringer, Angles						
„ Bulb Plate for——length						
„ Intercostal Plate for——length						
„ Attached to outside Plating with Angle						
Upper Side Stringer, Angles						
„ Bulb Plate for——length						
„ Intercostal Plate for——length						
„ Attached to Outside Plating with Angle						
Main Deck Stringer Plate, breadth & thickness						
„ Angle on ditto						
„ TiePlates fore & aft,outside Hatchways						
„ Diagonal Tie Plates, No. of pairs ——						
„ Main Deck*, Iron or Steel for——length						
„ Wood Deck, material and thickness						

	In Ship.		Per Rule or as Approved.	
	Inches.	16ths or 20ths.	Inches.	16ths or 20ths.
Lower Deck Stringer Plate, breadth and thickness				
Is the Stringer Plate attached to the Outside Plating?				
„ Angles on ditto, No.——				
„ Tie Plates, outside Hatchways				
„ Diagonal Tie Plates, No. of pairs——				
„ Deck, material and thickness ——				
Hold Stringer Plate				
Is the Stringer Plate attached to the Outside Plating?				
„ Angles on ditto, No.——				
Poop Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck, material and thickness ——				
Bridge Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck, material and thickness ——				
Forecastle Deck Stringer Plate, breadth and thickness				
„ Angle on ditto				
„ Tie Plates				
„ Deck, material and thickness ——				

* If Iron or Steel Deck, state if whole or part, and if Wood Deck is laid thereon.

BULKHEADS.	Number.		Thickness.	STIFFENERS.			Single or Double Frames.	Height up.
	In Vessel.	Per Rule.		Horizontal.	Vertical.	Spacing.		
			16ths or 20ths.	Inches.	Inches.	Inches.		
W. T. Bulkheads								
Partition „								

Are the outside Plates doubled two spaces of Frames in length?——

PLATING. RIVETING.

STRAKES.	AS IN SHIP.				PER RULE OR AS APPROVED.		EDGES.				BUTTS.					
	Amidship.		Frward	Aft.	Amidships.		Single or Dble.	Brdth of Lap.	Rivets.		D'ble or Treble & for what Length.	Rivets.		Straps.		If Lapped.	
	Brdth.	Thickness.	Thickness.	Thickness.	Brdth.	Thickness.			Diam.	Spac'g cr. to cr.		Diam.	Spac'g cr. to cr.	Brdth	Th'ckness.	Brdth	For what Lng.
	Inches.	16ths or 20ths.	16ths or 20ths.	16ths or 20ths.	Inches.	16ths or 20ths.		Inches.	Inches.	Inches.		Inches.	Inches.	Inches.	16ths or 20ths.	Inches.	Feet.
Keel (*Riveting*)																	
Garboard or A Strake																	
B „																	
C „																	
D „																	
E „																	
F „																	
G „																	
H „																	
J „																	
K „																	
L „																	
M „																	
N „																	
Poop or R.Q.Dk. Sides																	
Bridge Sides																	
Forecastle Sides																	
Lengths of Plating																	

Manufacturer's name or trade mark of the Iron or Steel (state process of manufacture of Steel) used for Frames, Floors, Beams, Keelsons, Tie, and Stringer Plates, Outside Plating, &c.——

Main Stringer Plate: Butts, treble riveted for——length amidship; Straps, single, double or overlapped for——length amidship. Butts of Bilge and Side Stringers and Tie Plates, treble or double riveted?—— Centre Girder Butts,——riveted. Keelsons Butts,——riveted. Frames, riveted through Plates with——in. Rivets, about——apart. Rivets, state whether of Iron or Steel——.

Frames extend in one length from——to——. Reversed Frames on floors and frames extend from——middle line to——and to——alternately.

MASTS AND SPARS.

RIGGING.

MASTS, &c.	Material	Total length.	DIAMETER AND THICKNESS AT—				No. of Plates in Round.	ANGLES.		RIVETING.		RIGGING. MATERIAL.	SHR'DS.		STAYS.	
			Partners.	Heel.	Hounds.	Heads		Number.	Size.	Seams.	Butts.		No.	Size	No.	Size
		Ft. Ins.	Ins.	Ins.	Ins.	Ins.	No.	No.	Ins.					Ins.		Ins.
Lower Masts..... Fore ...																
Main ...																
Mizen...																
Jigger..																
Bowsprit																
Topmasts ..... Fore ...																
Main ...																
Mizen...																
Jigger..																
YARDS.			At Centre.		At Ends.							QUALITY				
Lower Yards..... Fore ..			"		"											
Main ...			"		"											
Crossjck			"		"											
Jigger..			"		"							SAILS.				
Top-sail Yards Fore ... Lower...			"		"											
Upper...			"		"							Suit of				
Main ... Lower...			"		"											
Upper...			"		"							Sails, and				
Mizen ... Lower...			"		"											
Upper...			"		"							the following Spare Sails—				
Jigger... Lower...			"		"											
Upper...			"		"											
Remainder of Spars.....																

EQUIPMENT No.——LETTER——. ANCHORS. TONNAGE FOR TRAWLERS——U.Dk.

No. of Cert.	Anchors.	Weight, Ex. Stock.			Weight of Stock.			Test, per Cert.				Weight req. by Rule.			Description of Anchor.	Makers.	Where and when tested, and Superintendent.
		Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	*If Patent state name of Patentee.*		
	1st Bower																
	2nd "																
	3rd "																
	Collective weight																
	Stream																
	Kedge.....																
	2nd Kedge																

CHAIN CABLES.

HAWSERS AND WARPS.

Number of Certificate.	Faths.	Size.	Test per Cert. Tons.	Weight of Chain Cable		Fthms. & Size. Per Rule	Description.	Makers of Cables.	Where and when tested and Superintendent.	Material.	Faths.	Size.	Breaking Test of Steel Wire Towline.	Faths. & Size per Rule
				Supplied.	Per Rule.									
										Towline				
										Hawser				
										Warp				
Iron Stream Chain or Steel Wire														

Boats——Pumps, Number——Diameter of Barrel and Tail Pipe——Windlass is——Capstan——Number of Scuppers, and number and dimensions of Freeing Ports——Ceiling in Holds, thickness and material——Ceiling 'tween Deck, thickness and material——Cargo Hatchways.—How formed?——Hatches, if strong and efficient?——State size No. 1 Hatch (Forward)——No. 2 Hatch——No. 3 Hatch ——Number of Web Plates, Shifting Beams, and Fore and Afters to each Hatch——No. of Breasthooks ——No. of Crutches——Bulwarks, Height above deck and description——Main Rail, material and size ——Topgallant Rail——

The above is a correct description.

Builder's Signature (here only)———— *Surveyor's Signature*————

Surveyor to Lloyd's Register of British and Foreign Shipping.

CORRESPONDENCE.—State dates and initials of letters respecting this case (*Reference should be made to any correspondence connected with the case.*)

WORKMANSHIP.—Are the butts of plating planed or otherwise fitted ?——Is the riveted work properly closed ?——Are the liners between the frames and plates solid single pieces ?——Do the holes for riveting plate to frames, butt straps, or plate to plate, &c., conform well to each other ?——Are the rivet holes well and sufficiently countersunk in the plate and punched from the faying surfaces ?——Do any rivets break into or through the seams or butts of the plating ?——Are the butts of Plating, Stringers, &c., properly shifted and strapped or lapped ?————

GENERAL REMARKS. (*State quality of workmanship, &c.*)

The Surveyor should state the Number of Report and Name of any Sister Vessel.

PARTICULARS FOR RECORD IN Register Book.—Length of Poop————ft., R.Q.D. or Break————ft., Bridge Deck————ft., Forecastle————ft. (in feet and tenths). No. and Material of Decks (if Iron or Steel) and whether wholly or partially covered with wood, and No. of tiers of Beams (this information is to be given as it should appear in the Register Book)————Official No.————Signal Letters————How are the surfaces preserved from oxidation ? Inside——Outside——

Order for Special Survey No.——
Date————————
Order for Ordinary Survey No. ——
Date————————
No.—in Builder's Yard.

} Dates of Surveys held while building, as per Section 18. {

1st. On the several parts of the frame, when in place, and before the plating was wrought ————
2nd. On the plating during the process of riveting ——
3rd. When the beams were in and fastened, and before the decks were laid——
4th. When the ship was complete, and before the plating was finally coated or cemented——
5th. After the ship was launched and equipped————
Total No. of Visits————

The amount of the Entry Fee .....£ : :
Special Survey Fee.....£ : :
Travelling Expenses (*if any*) .....£ : :

Fees applied for,
————18—
Received by me,
————18—
————————

Certificate to be sent to————

I am of opinion this Vessel should be classed————

With, or without Freeboard, as condition of Class————

————————————————————

Surveyor to Lloyd's Register of British and Foreign Shipping.

Committee's Minute————————————————————

Character assigned————————————————————

(*The Surveyors are requested not to write on or below the space for Committee's Minute.*)

FORM No. 2. FOR REPORT OF SURVEY FOR REPAIRS, ETC.

No. —— Port of ——— No. in Reg. Book ——— Survey held at ——— Date, First Survey ———
(No. of Visits———) Last Survey——— 18—— on the——— Master ——— Tonnage :—Gross———
Under Deck ——— Net ——— Built at ——— By whom ——— When ——— Owners ———
Port belonging to ——— Owner's Address ——— (if not already recorded in Appendix to Register Book.) Surveyed Afloat or in Dry Dock ? ——— Name of Dock ——— Destined Voyage ———
WB=DBa ——— tons ; f ——— tons ; uE&B ——— tons ; CellDB ——— tons ; FPT ——— tons ; APT ——— tons ; MT ———tons.

Last Survey, No. ——— Port ———

Periodical Surveys, when held, must be reported in detail and *seriatim* in the terms of the Rules. State clearly the cause of Repairs, if any, and, in detail, the nature and extent of Examinations and subsequent Repairs. Repairs on account of Damage (the cause of which must be stated) should be separated from Repairs due to other causes ; and besides being detailed in the body of the report, should be summarised in the form shown below. Whenever the replacement of Anchors or Chains is reported, the particulars of weight or size and test of the articles should be clearly stated, and also the weight or size, &c., required by the Rules, together with the vessel's Equipment Letter, if any. State also the dates and initials of any letters respecting this case ———

Particulars of Classification (which must be inserted precisely as in Register Book and Supplements) :—
CHARACTER : ✠ for Special Survey. Date of last Survey and of Periodical Surveys —— Years assigned now expired —— Machinery and Boiler Surveys (including date of N.B., if any).

Society's freeboard (if assigned) as painted on Ship and now verified —— ft. —— ins.

Repairs, or Examination as per Rule, for ———

Summary of Damage Repairs :— ——— Plates, Faired or Repaired ; ——— Frames, ditto. —— Plates, Renewed ; ——— Frames, ditto. Other repairs.———

Present condition of the

Decks .....
Waterways.....
Coamings .....
Upper Deck Beams and Fastenings..
Lower Deck Beams and Fastenings..
Plating .....
Planking .....
Treenails or Rivets .....
Breasthooks and Stemson .....
Transoms, Pointers, and Crutches ..
Timbers of Frame at the openings ..
Ditto at other places ..
Keelsons.....

Clamps, Shelfs and Stringers .....
Salting .....
Ceiling .....
Cement or Asphalt (state which)....
Tanks (state if now tested) .....
Caulking of Bottom, Deck, and Waterways.....
Copper, or Y.M. (state if on Felt)—
When put on, Month—Year .....
Rudder .....
Windlass and Capstan.....
Pumps .....
Engine Room Skylights .....

Coal Bunker, Openings, Lids, &c.....
Scuppers .....
Cargo and Main Hatchways .....
Hatches .....
Boats .....
Masts, Yards, &c. .....
Condition, how ascertained .....
Sails .....
Anchors, No. of .....
Cables, length, size (state if now ranged) .....
Hawsers and Warps.....
Standing and Running Rigging ....

General Observations, Opinions as to Class, Recommendation, &c. :—

State clearly whether any and, if so, what alteration is suggested to be made in the existing classification and notification of the vessel in the Register Book consequent upon this survey, thus, for example —" ——— to remain as now classed in the Register Book *without fresh record of Survey*," " to remain as classed and to have record of survey, 9,91," or " to remain as classed and to have record of survey, 9,91, and the notations of *ss No.* 1–91 and ptND91, &c."

Office Fee (if chargeable) per Scale II., Section 27..... £ : :
Survey Fee (per Section 28)..... £ : :
Special Damage or Repair Fee (if any) per Section 28 £ : :
Travelling Expenses (if chargeable) ..... £ : :
Second Surveyor's Fee (if any)..... ..... £ : :

Fees applied for, ———18——
Received by me, ———18——
———

*Is Certificate now required ?———

Committee's Minute ——

Character assigned ——

*Certificate to be sent to——

——— *Surveyor to Lloyd's Register of British and Foreign Shipping.*

(The Surveyors are requested not to write on or below the space for Committee's Minute.)

No. 7.—FORM OF CERTIFICATE OF CHARACTER.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

No. ——

No. 2, White Lion Court, Cornhill,
London, *189*

These are to Certify, That the ———— of ————
———— Master, ———— Tons, bound to ———— has been Surveyed at
———— by the Surveyors to this Society, and reported to be, on the ————
and that she has been CLASSED and entered in the REGISTER BOOK of this Society with the Character

Witness my hand,

———— *Secretary.* ———— *Chairman.*

Charge

No. 8.—FORM OF ENGINEER-SURVEYOR'S REPORT ON MACHINERY.

No.—— Port of —— No. in Reg. Book —— Survey held at —— Date, first Survey —— Last Survey —— 18— (Number of Visits ——) on the —— Tons, gross —— net —— Master —— Built at —— By whom built —— When built —— Engines made at —— By whom made —— When made —— Boilers made at —— By whom made —— When made —— Registered Horse Power —— Owners —— Port belonging to —— Nom. horse power as per Section 28 ——

ENGINES, &c.

Description of engines —— No. of Cylinders —— Diameter of cylinders —— Length of stroke —— Revolutions per minute —— Diameter of screw shaft, as per rule —— as fitted —— Diameter of tunnel shaft, as per rule —— as fitted —— Diameter of crank shaft journals —— Diameter of crank pin —— Size of crank webs —— Diameter of screw —— Pitch of screw —— No. of blades —— State whether moveable —— Total surface —— No. of feed pumps —— Diameter of ditto —— Stroke —— Can one be overhauled while the other is at work —— No. of bilge pumps —— Diameter of ditto —— Stroke —— Can one be overhauled while the other is at work —— No. of donkey engines —— Size of pumps —— No. and size of suctions connected to both bilge and donkey pumps in engine room —— in holds, &c. —— No. of bilge injections —— sizes —— Connected to condenser or to circulating pump —— Is a separate donkey suction fitted in engine room and size —— Are all the bilge suction pipes fitted with roses —— Are the roses in engine room always accessible —— Are the sluices on engine room bulkheads always accessible —— Are all connections with the sea direct on the skin of the ship —— Are they valves or cocks —— Are they fixed sufficiently high on the ship's side to be seen without lifting the stokehold plates —— Are the discharge pipes above or below the deep water-line —— Are they each fitted with a discharge valve always accessible on the plating of the vessel —— Are the blow-off cocks fitted with a spigot and brass covering plate —— What pipes are carried through the bunkers —— How are they protected —— Are all pipes, cocks, valves, and pumps in connection with the machinery and all boiler mountings accessible at all times —— Are the bilge suction pipes, cocks, and valves arranged so as to prevent any communication between the sea and the bilges —— When were stern tube, propeller, screw shaft, and all connections examined in dry dock —— Is the screw shaft tunnel watertight —— Is it fitted with a water-tight door —— worked from ——

BOILERS, &c.

(Letter for record ——) Total heating surface of boilers —— No. and description of boilers —— Working pressure —— Tested by hydraulic pressure to —— Date of test —— Can each boiler be worked separately —— Area of fire grate in each boiler —— No. and description of safety valves to each boiler —— Area of each valve —— Pressure to which they are adjusted —— Are they fitted with easing gear —— Smallest distance between boilers or uptakes and bunkers or woodwork —— Mean diameter of boilers —— Length —— Material of shell plates —— Thickness —— Description of riveting : circum. seams —— long. seams —— Diameter of rivet holes in long. seams —— Pitch of rivets —— Lap of plates or width of butt straps —— Percentages of strength of longitudinal joint, rivets —— plate —— Working pressure of shell by rules —— Size of manhole in shell —— Size of compensating ring —— No. and description of furnaces in each boiler —— Material —— Outside diameter —— Length of plain part, top —— bottom —— Thickness of plates, crown —— bottom —— Description of longitudinal joint —— No. of strengthening rings —— Working pressure of furnace by the rules —— Combustion chamber plates, material —— thickness, sides —— back —— top —— bottom —— Pitch of stays to ditto, sides —— back —— top —— If stays are fitted with nuts or riveted heads —— Working pressure by rules —— Material of stays —— Diameter at smallest part —— Area supported by each stay —— Working pressure by rules —— End plates in steam space, material —— thickness —— Pitch of stays —— How are stays secured —— Working pressure by rules —— Material of stays —— Diameter at smallest part —— Area supported by each stay —— Working pressure by rules —— Material of front plates at bottom —— thickness —— Material of lower back plate —— thickness —— Greatest pitch of stays —— Working pressure of plate by rules —— Diameter of tubes —— Pitch of tubes —— Material of tube plates —— thickness, front —— back —— Mean pitch of stays —— Pitch across wide water spaces —— Working pressures by rules —— Girders to chamber tops, material —— depth and thickness of girder at centre —— Length as per rule —— Distance apart —— Number and pitch of stays in each —— Working pressure by rules —— Superheater or steam-chest, how connected to boiler —— Can the superheater be shut off and the boiler worked separately —— Diameter —— Length —— Thickness of shell plates —— Material —— Description of longitudinal joint —— Diameter of rivet holes —— Pitch of rivets —— Working pressure of shell by rules —— Diameter of flue —— Material of flue plates —— Thickness —— If stiffened with rings —— Distance between rings —— Working pressure by rules —— End plates, thickness —— How stayed —— Working pressure of end plates —— Area of safety valves to superheater —— Are they fitted with easing gear ——

DONKEY BOILER.

Description —— Made at —— By whom made —— When made —— Where fixed —— Working pressure —— Tested by hydraulic pressure to —— No. of Certificate —— Fire grate area —— Description of safety valves —— No. of safety valves —— Area of each —— Pressure to which they are adjusted —— If fitted with easing gear —— If steam from main boilers can enter the donkey boiler —— Diameter of donkey boiler —— Length —— Material of shell plates —— Thickness —— Description of riveting long. seams —— Diameter of rivet holes —— Whether punched or drilled —— Pitch of rivets —— Lap of plating —— Percentage of strength of joint, rivets —— plates —— Thickness of shell crown plates —— Radius of ditto —— No. of stays to ditto —— Diameter of stays —— Diameter of furnace, top —— bottom —— Length of furnace —— Thickness of furnace plates —— Description of joint —— Thickness of furnace crown plates —— Stayed by —— Working pressure of shell by rules —— Working pressure of furnace by rules —— Diameter of uptake —— Thickness of uptake plates —— Thickness of water tubes ——

SPARE GEAR. State the article supplied ——

The foregoing is a correct description :—

——————————Manufacturer.

GENERAL REMARKS. State quality of workmanship, opinions as to class, &c. ——

Certificate (if required) to be sent to ——

The amount of Entry Fee .....£ : :
Special .....£ : :
Donkey Boiler Fee .....£ : :
Travelling Expenses (if any) £ : :

When applied for————18—
When received ————18—

Committee's Minute————
Assigned————

————*Engineer-Surveyor to Lloyd's Register of British and Foreign Shipping.*

FORM No. 9 FOR REPORT OF SURVEY FOR REPAIRS, &c., OF ENGINES AND BOILERS.

No. —— Port of ————No. in Reg. Book ——— Survey held at ——— Date, First Survey ———
Last Survey ——— 18 —— (No. of Visits) ——— on the Machinery of the Wood, Iron or Steel ——
Master ——— Vessel built at ——— By whom ——— When ——— Tonnage, Gross ———
Net ——— Registered Horse Power ——— Engines made at ——— When ——— Boilers,
when made (Main) ——— (Donkey) ——— No. of Main Boilers ——— Owners ——— Port ———
Voyage ——— Steam pressure, in Main Boilers ——— in Donkey Boiler ——— If Surveyed
Afloat or in Dry Dock (state name of Dock) ———
Last Survey, No. ——— Port ———

Particulars of Classification (which must be inserted precisely as in Register Book and Supplements) :—
CHARACTER : ✠ for Special Survey. Date of last Survey and of Periodical Surveys —— Years assigned now expired —— Machinery and Boiler Surveys (including date of N.B., if any).

Particulars of Examination and Repairs (if any)——

Periodical Surveys, when held, must be reported in detail and *seriatim* in the terms of the Rules. State clearly the cause of repairs, if any, and, in detail, the nature and extent of examinations and subsequent Repairs. Repairs on account of Damage (the cause of which must be stated) should be separated from Repairs due to other causes ; and besides being detailed in the body of the report, should be briefly summarised at the end of the report. State also the dates and initials of any letters respecting this case ————

Did the Surveyor personally go inside each Main Boiler separately and make a thorough examination at the time ?——
Do. „ Donkey „ „ „ ——
If this was not done, state for what reasons ? ———
And what parts of the Boilers could not be thus thoroughly examined ? ———
Also what special means, in the absence of internal examination, were adopted by the Surveyor to assure himself of the thorough efficiency of those parts of each boiler ? ———
Did the Surveyor examine the Safety Valves of the Main Boiler ? ———
At what pressure were they afterwards adjusted under steam ? ———
Did the Surveyor examine the Safety Valves of Donkey Boiler ?———
To what pressure were they afterwards adjusted ?———
If the Survey is not complete state what arrangements have been made for its completion ?———

General Observations, Opinion, and Recommendation :—

(State clearly what alteration, if any, is suggested to be made in the existing classification and notification of the vessel's machinery in the Register Book, consequent upon this survey : thus, for example, B.S. 9,92, B.&M.S. 9,92 or ✠L.M.C. 9,92, as the case may be.)

Office or Registration Fee (per Section 27) ...£ : :
Survey Fee (per Section 28) .....£ : :
Special Damage Fee (per Section 28) .....£ : :
Travelling Expenses (if chargeable) .....£ : :
*State if Certificate is required ————————

Fees applied for ————18——
Received by me, ————18——

*Certificate to be sent to——

Committee's Minute ———
Assigned——

————*Engineer-Surveyor to Lloyd's Register of British and Foreign Shipping.*

(The Surveyors are requested not to write on or below the space for Committee's Minute.)

FORM No. 10.—FORM OF CERTIFICATE OF LLOYD'S MC FOR BOILERS AND ENGINES.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.
ESTABLISHED 1834.

No. ——

No. 2, White Lion Court, Cornhill,

London 189

These are to Certify, That the Engines and Boilers of the ——— of ——— Master ——— Tons, have been Surveyed at ——— by the Engineer-Surveyors to this Society, and reported to be on the ——— in good, efficient, and safe working condition, and that the Record LMC. (in red) ——— (Lloyd's Machinery Certificate), has been made in the Register Book accordingly.

Witness my hand,

——— *Secretary.* ——— *Chairman.*

Charge

FORM No. 11.—FORM OF CERTIFICATE OF B&MS FOR BOILERS AND ENGINES.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.
ESTABLISHED 1834.

No. —

No. 2, White Lion Court, Cornhill,
London, 189

These are to Certify, That the Boilers and Machinery of the ——— of ——— Master ——— Tons, have been Surveyed at ——— by the Engineer-Surveyors to this Society and reported to be on the ——— in good and efficient condition, and that the Record B&MS (in red) ——— (Boilers and Machinery Surveyed), has been made in the Register Book accordingly.

——— *Secretary.*

Charge *Witness my hand,* ——— *Chairman.*

FORM OF CERTIFICATE OF THE CLASSIFICATION OF SHIPS IN THE LATE UNDERWRITERS' REGISTER OF IRON VESSELS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.
ESTABLISHED 1834.

Amalgamated 1885 with the Underwriters' Registry of Iron Vessels.

ESTABLISHED 1862.

No. ——

No. 2, White Lion Court, Cornhill,
London, 189

This is to Certify, That the ———
of ———, ——— Master, ——— Tons, bound to ———, has been surveyed at ——— by the Surveyors to this Society, and reported to be on the ——— in a good and efficient state, and fit to carry dry and perishable Cargoes, and that she has been continued as Classed and is entered in the Register Book of this Society with the Character subject to periodical Surveys.

——— *Secretary.* *Witness my hand,*

Charge ——— *Chairman.*

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,
AND THE
UNDERWRITERS' REGISTRY FOR IRON VESSELS
AMALGAMATED.

NOTICE IS HEREBY GIVEN that it has been mutually resolved by the Committee of Lloyd's Register of British and Foreign Shipping and the Committee of the Underwriters' Registry for Iron Vessels to amalgamate the two Registries.

In accordance with the terms of amalgamation :—

(1.) The publication of the "Underwriters' List of Iron Vessels" has been discontinued.

(2.) Vessels holding a Class in the Underwriters' Registry will be entitled to the publication of this Class in future issues of Lloyd's Register Book so long as their Owners comply with the Rules of the Underwriters' Registry (1884-5) relating to Periodical Surveys.

(3.) The information hitherto given in the Supplements to the Register Book of the Underwriters' Registry relating to Periodical Surveys, Changes of Owners, &c., will be inserted by posting with type in Lloyd's Register Book, and will also appear in the Supplements.

(4.) In case the Owners of Vessels holding a Class in the Underwriters' Registry only, desire also a class under Lloyd's Register, the Committee of this Society undertake to favourably consider the claims of such Vessels on the documents produced by the Underwriters' Registry, and the necessary surveys as to present condition, with a view to assigning these Vessels the highest possible Class to which they are entitled, free of charge to the Owners. Full allowance will be made for any compensation for deviation from the Rules of Lloyd's Register, and the Vessels given the advantage of any difference in scantlings between the Rules as now existing and those which were in force when the Vessels were built.

The Committee of this Society will employ the Staff of the Underwriters' Registry, so far as may be practicable, in the Survey of Vessels holding a Class in that Registry, and of Vessels now Building or Contracted to be built to Class therein.

In the interest of the Owners of Vessels Classed in the Underwriters' Registry, some Members of the Committee of that Registry will have seats on Lloyd's Register Committees in London and Liverpool.

All communications respecting vessels Classed or now Building to Class in the Underwriters' Registry should in future be addressed to the Secretary to Lloyd's Register, either in London or Liverpool, as may be most convenient.

In the absence of any intimation from Owners of Ships classed in the Underwriters' Registry to the contrary, it will be concluded that they are quite agreeable to the Classes assigned in that Registry being recorded in Lloyd's Register Book as proposed.

By order of the Committee,
B. WAYMOUTH,
Secretary.

Lloyd's Register of British and Foreign Shipping,
2, *White Lion Court, Cornhill, London,*
1*st September*, 1885.

CIRCULAR No. 589.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court, Cornhill, E.C.*
18*th February*, 1886.

WEAR OF CHAIN CABLES.

SIR,

The question of deterioration of Chain Cables by wear has occupied the attention of the Committee; and I am directed to acquaint you that when a chain is found to be worn to an extent which in your opinion renders it inefficient, special care should be taken to examine all its parts, and if Chain Cables are found to be worn, ranging from two-sixteenths to four-sixteenths of an inch or above, according to their sizes, and the owners decline to renew the same, all the circumstances of the case should, without delay, be set forth for the information and determination of the Committee.

I am, Sir, your obedient Servant,
B. WAYMOUTH,
Secretary.

No. 488.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING

LARGE FORGINGS.

With reference to Notice No. 453, of the 8th December, 1881, on the subject of the inspection of large forgings, intended to be used in the construction of ships or engines proposed to be built under the survey of the Surveyors to this Society, the Committee have recently had under consideration some cases in which, owing to the omission of the Shipbuilders and Engineers to give early intimation to the local Surveyors of the intended manufacture of the forgings, the requisite inspection at the works could not be made by the Society's officers.

The Committee, therefore, think it right, in order to obviate any inconvenience in future, to suggest that in all cases Shipbuilders and Engineers should furnish the local Surveyors with all necessary information *when the orders for such forgings are issued.*

By Order of the Committee,
B. WAYMOUTH,
Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.,
25*th January*, 1883.

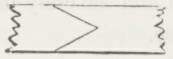
No. 583.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

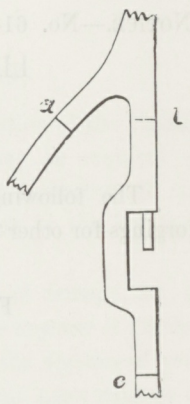
2, White Lion Court, Cornhill, London, E.C.
January 19th, 1886.

WELDING OF LARGE FORGINGS.

SIR,

The Committee having had under their consideration the subject of the manufacture of Large Forgings for shipbuilding purposes, I am directed to state that from experiments which have been made it has been found that to ensure sound welds in heavy forgings steam hammers should be employed instead of the sledge hammers formerly used ; and the welds when of  form should have the V angle not more than 60°. The old plan of screwing the parts together at a welding heat is not found to be satisfactory, especially in forgings of considerable sectional area, and in view of this, in future the welding of forgings exceeding forty square inches in sectional area will be required by the Committee to be done with steam hammers.

It has been the practice in some works to place the "shut" of the lower part of a stern frame in the sole piece. This is considered to be very objectionable ; and the Surveyor should inform manufacturers that the welding should be placed in the lower part of the posts in all cases, and that such connections in the sole piece will not be sanctioned. In Rudder frames the welds of the upper part of the frame to the main piece should not be placed close together as indicated in the sketch at *a*, *b* ; but should be arranged so as to be well clear of each other as indicated by *a*, *c*.



In cases where stern frames or rudders are taken out of vessels to be repaired, the Surveyors should furnish full particulars of the defects observed, including a sketch shewing the position and nature of the fracture on the Report, for the information of the Committee, so that a record may be kept in this office of all failures in such forgings.

I am, Sir, your obedient servant,

B. WAYMOUTH,
Secretary.

CIRCULAR No. 536.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL MAST CAPS.

SIR,

In reference to the use of cast steel mast caps, I am directed to inform you that the Committee of this Society will be prepared to admit of such steel mast caps being fitted to vessels intended to be classed in the Register Book on the following conditions :—

It is requisite that builders proposing to use cast steel mast caps shall, in the first instance, state the name of the firm by whom the caps are to be made, in order that the Committee may be satisfied that the manufacturers have proper facilities for making steel caps of a satisfactory quality.

With this object, the manufacturers will be required to give notice to the Committee when an opportunity can be afforded to the Society's surveyors to attend at the works, in order to report upon the appliances in use and the processes of manufacture, and also to ascertain by crucial tests that the material of which the caps are proposed to be made is of good and ductile quality.

Upon a favourable report being received from the Surveyors, after the inspection of the works of a manufacturer, the Committee will sanction the use of caps of his manufacture, provided test pieces be cast on the caps of sufficient size, to enable the Surveyors to subject the same to such tests as they may deem necessary, in order to satisfy themselves that the material is of good quality. The caps also are to be suspended and severely hammered in the presence of the Surveyors to ensure that the casting is sound in each case.

I am, your obedient servant,

B. WAYMOUTH, *Secretary.*

2, White Lion Court, Cornhill, E.C.
6th November, 1884.

NOTICE.—No. 614.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHARGES FOR INSPECTION OF FORGINGS.

The following scale of charges has been approved by the General Committee for the inspection of forgings for other than new vessels :—

SHIP FORGINGS OR CASTINGS.

For vessels not exceeding 600 tons	£2	2	0
„ over 600 tons but not exceeding 1600 tons ...	3	3	0
„ over 1600	4	4	0

ENGINE FORGINGS OR CASTINGS.

For shafts up to 12 inches in diameter	£1	1	0
„ over „ „	2	2	0

These fees to be chargeable for the inspection of the whole or any portion of shafting which is not being forged and finished at the works where the engines are being made under the survey of the Society's Officers, and when more than two visits are necessary, to be increased.

N.B.—Travelling expenses are to be charged in the case of both old and new vessels.

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

2 *White Lion Court, Cornhill, London, E.C.*
16*th December*, 1886.

(*See Notice No.* 620.)

No. 620.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHARGES FOR INSPECTING CASTINGS OR FORGINGS AS SET FORTH IN NOTICE No. 614.

In order to obviate misunderstanding arising in regard to the responsibility for the Payment of the Fees recently approved by the Committee of this Society for the inspection of Castings or Forgings, NOTICE IS HEREBY GIVEN that the charges in question, including travelling expenses, will be payable by the Forge or other Company by whom the forgings or castings are made.

By order of the Committee,

B. WAYMOUTH,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.*
22*nd February*, 1887.

No. 636.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

DEAR SIR,—I am directed to draw your attention to the fact that it is a condition of the classification of vessels by this Society that all Repairs of Ships or their Machinery that may be required at ports where there is a Surveyor to the Society, in order to the vessels retaining their characters in the Register Book, must be carried out under the inspection and to the satisfaction of the Society's Surveyor.

As the non-observance of this requirement in the case of vessels requiring repairs of damage, &c., at ports abroad has in some instances occasioned inconvenience to Owners, as well as expense of further surveys, I would venture to suggest the advisability of your giving instructions to the Masters of your vessels and to your Agents abroad, in all cases where surveys are required consequent upon damage or otherwise, to call in the Society's local Surveyor to hold such surveys, in order that the vessels' character in the Register Book may be duly maintained.

I may point out that, besides complying with the requirements of the Rules of this Society for the continuance of the classification of vessels, surveys held by the Society's Surveyors abroad will also serve all the purposes of Consular Surveys, which, being, as you are aware, *purely optional*, will not then be necessary.

I am, Dear Sir,

Yours very truly,

B. WAYMOUTH,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.*
30*th August*, 1887.

No. 647.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL ANCHORS.

NOTICE IS HEREBY GIVEN that the Committee of this Society will hereafter require that all Cast Steel Anchors intended for vessels classed or proposed to be classed in the Society's Register Book shall be subjected, in addition to the statutory tests, to the percussive, hammering, and bending tests recommended in the recent report of the Committee appointed by the Board of Trade to consider the question of tests of Cast Steel Anchors.

These tests, which are hereunder set forth, must be carefully and completely made in the presence and to the satisfaction of officers appointed by the Committee, viz. :—

PERCUSSIVE TEST.

1. Anchors, or when anchors are made of more than one piece, each piece shall be subject to this test, as follows :—

GIVEN WEIGHT.	GIVEN HEIGHT.
15 cwt. and below	15 feet.
Above 15 cwt.	12 feet.

The anchor or piece shall be raised the given height for the given weight and shall be dropped on an iron slab.

The given height means that the lowest part of the anchor or piece when suspended shall be at least the given height above the iron slab on to which it is to be dropped.

2. An anchor of the Admiralty pattern shall first be raised vertically to the given height with its shanks and arms in a horizontal position, and shall be let fall from that height.

3. It shall then be raised a second time to the given height, and shall be suspended with the crown downwards. Two iron blocks shall be placed underneath it, and it shall be let fall from this position so that one of the blocks receives it on the middle of one arm, and the other block receives it on the middle of the other arm.

4. The slab for the horizontal test shall be of steel or iron, well laid on a solid concrete foundation to the satisfaction of the inspector.

5. If the slab on which the anchor falls is broken, the test shall be repeated until a slab is made that does not break.

6. The blocks for the vertical test shall be solid, and shall be of sufficient height to prevent the

crown of the anchor from touching the slab, and shall be otherwise to the satisfaction of the inspector.

HAMMERING TEST.

7. When the percussive test has been passed successfully, to the satisfaction of the inspector, the anchor or piece shall be slung and freely put to a hammering test as follows, that is to say, it shall be well hammered over its parts with a sledge hammer weighing not less than 7 lbs., and shall be required to give under this treatment such a clear ring in all its parts as shall satisfy the inspector that the casting is sound, and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

BENDING TEST

8. Cast steel may be passed as sufficiently ductile for anchors when a piece of each casting, 8 inches in length, is cut from the casting, turned to 1 inch in diameter, and is then bent cold by hammering through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, without showing signs of flaw or fracture.

9. There must be a piece cast on each cast steel anchor, or on each portion of such anchor when it is made of more than one casting, and such piece must be of sufficient size to enable one test piece of the size before stated to be cut out of it, or it may be (at the discretion of the manufacturer) of sufficient size to enable four test pieces to be cut out of it. If it is only of sufficient size to enable one test piece to be cut out of it, that piece shall be subjected to the bending test named in paragraph 8, and, if it fails to withstand it, the casting is to be condemned.

If the piece is large enough to enable four test pieces to be cut out of it, these four test pieces shall be disposed of as follows, that is to say, one of them shall be turned in a lathe to 1 inch in diameter for a length of 8 inches, and bent cold through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, and if it withstands this test without flaw or fracture, shall be deemed to have withstood a satisfactory test for ductility. If the one test piece does not pass this test, all or any of the other three test pieces may be tested in a similar manner, and if any one of the four tests pieces passes this test, the anchor or part of the anchor, as the case may be, shall be deemed so far satisfactory.

ANNEALING.

10. Each anchor must be properly and sufficiently annealed, and when so annealed, shall be stamped "annealed steel." Annealing is not to be regarded as proper, or efficient, unless the process extends from three days for small anchors, up to six days for large ones.

By order of the Committee,

B. WAYMOUTH,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.*

10*th November*, 1887.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL ANCHORS.

Sir.—The Committee have recently had under consideration a report by the Chief Engineer Surveyor on the several methods of making Steel Castings.

Notwithstanding all the care and precaution that may be taken in forming the moulds, and in the selection of the material used for the purpose, Steel Castings are not infrequently found with more or less serious cracks or defects, owing generally to the uneven rate of cooling.

With regard to Cast Steel Anchors, and with reference to Circular No. 647 (of which I enclose a copy), I am directed to request that you will, in future, examine the Castings of all parts of Steel Anchors intended for Ships classed or proposed to be classed in the Society's Register Book, *before* they are annealed.

You will then be better able to observe any defects which may exist, the skin or scale put on by annealing, rendering it more difficult to detect cracks or other defects, particularly when such cracks or defects have been carefully hammered up and closed.

If on examination any such cracks or defects are observed, the Anchor should not be tested or passed; but if the defects appear to be on the surface only and can be entirely cut out without damaging the Anchor, this may be done in your presence; you must however satisfy yourself that they are entirely removed before you proceed with the tests.

I am, Sir,

Your obedient servant,

HENRY C. SEYFANG,

Secretary,

Committee on Proving Machines.

CIRCULAR No. 662.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

VESSELS CLASSED IN THE LATE UNDERWRITERS' REGISTRY FOR IRON VESSELS.

Sir,—I am directed to remind you that the following requirements of the Sixth Periodical Survey set forth in the Rules of the late Underwriters' Registry for Iron Vessels have to be complied with in the case of vessels classed by that Society :—

SIXTH SURVEY OR SPECIAL SURVEY.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions :—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

In pursuance of the foregoing requirements I have to state that, for the information of the Committee in dealing with the classification of vessels which have to pass this survey, the scantlings, when ascertained in the manner directed are to be submitted on a first entry form of report, and compared therein with the requirements of the Rules of the late Underwriters' Registry for 1884-85. A profile sketch is at the same time to be furnished, showing the positions in which the drilling of the shell plating has been made, and also the thickness of the plating on both sides of the vessel.

When, in the case of a vessel which has been classed in both Registries, the Sixth Survey is hld in conjunction with the Special Survey No. 3, the fee charged should be increased proportionately so as to cover the additional labour involved in the Sixth Survey.

I am, Sir,

Your obedient Servant,

B. WAYMOUTH,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.
23rd February, 1888.

NOTICE. No. 673.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

BUNKERS OF IRON AND STEEL SHIPS.

SIR,—The attention of the Committee has recently been drawn to the case of a steel steamer, in which the framing, stringers and beam ends in the Coal Bunker space had almost wasted away through corrosion after a period of only 8 years, during which time, however, it would appear that the vessel inside the bunkers had never been painted.

I am directed to acquaint you that, in view of the above, more than ordinary care is required in surveying bunkers; and you are to draw the attention of owners to the advantage of thoroughly coating such parts with some good preserving composition, such as Stockholm tar sprinkled with Portland cement, or best black varnish—put on the surfaces when clean and dry—in preference to the use of ordinary paint, more particularly in steel vessels in which the scantlings are less than in those built of iron.

I am, Sir,
Your obedient Servant,
B. WAYMOUTH.
Secretary.

2, White Lion Court, Cornhill, London, E.C.
5th May, 1888.

No. 676.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RECORD OF "EX STEAMER."

With reference to the practice of recording "ex-Steamer" in the Register Book after the names of sailing vessels that have originally been steamers,

Notice is hereby given, that the Committee, who recently had the subject under consideration, have resolved that this practice is to be continued.

The Committee, however, will be prepared to consider representations that may be made of them in regard to sailing vessels that were formerly auxiliary steamers, with a view to determining whether or not the record in question is to be made in the case of such vessels.

By order of the Committee,
B. WAYMOUTH, *Secretary.*

2, White Lion Court, Cornhill, E.C.
7th June, 1888.

CIRCULAR No. 675. (To SURVEYORS.)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.
22nd June, 1888.

PATENT CEMENTS.

SIR,

With reference to the use of PATENT CEMENTS for protecting the inside of bottoms of vessels, I am directed to acquaint you that the Committee have decided that they cannot sanction in future the use of other than Portland Cement for this purpose, in any vessel intended for Classification in the Society's Register Book, unless the consent of the Owner of the vessel be first obtained.

I am, Sir, your obedient servant,
B. WAYMOUTH, *Secretary.*

CIRCULAR No. 681. (TO SURVEYORS.)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.
20th August, 1888.

WORKMANSHIP.

SIR,

I have to call your special attention to the great necessity of insuring that the workmanship throughout in vessels built of either iron or steel shall be of the very best description.

The greatest care should be taken that all surfaces are closely fitted, and that all rivet holes should be made to properly conform with each other, also that where burrs occur, from punching or shearing, on faying surfaces, the same should be carefully chipped off before the surfaces are brought together.

Special care should also be taken to maintain the continuity of strength at abrupt terminations of erections and in way of deck openings, and ends of partial double bottoms.

The rivet holes in the landing edges of outside plating in way of butts should be arranged so as to be kept well clear of the butt, instead of coming in the joint as is sometimes found to be the case, and which should be avoided wherever practicable.

I am, Sir, your obedient servant,
B. WAYMOUTH, *Secretary.*

CIRCULAR No. 683. (TO SURVEYORS.)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.
28th September, 1888.

EXAMINATION OF MASTS AND SPARS.

SIR,

With reference to circular letters, Nos. 324 and 407, on the subject of the Examination of the Masts and Spars of vessels, I am directed to request that in all cases of Special Surveys or Surveys to ascertain and report on the condition of Masts and Spars, the Surveyors will either make a personal inspection of them, or call in the services of a competent and impartial person to go aloft for the purpose of making a careful examination in their presence.

I have to add that on these occasions the mast wedging is to be removed to ascertain the state of the masts in way thereof.

I am, Sir, your obedient servant,
B. WAYMOUTH, *Secretary.*

CIRCULAR No. 688. (To SURVEYORS.)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

29th November, 1888.

HOLES IN VERTICAL WEBS, &c.

SIR,

It having come to the knowledge of the Committee that in addition to the holes admitted in the girders and floors in cellular double-bottom vessels, a practice is growing up of lightening other parts, such as the vertical webs in the holds, stringer plates, &c., I am directed to request that you will not sanction any unnecessary holes being made in such parts, unless shown on the drawings submitted for consideration and approved by the Committee.

I am, Sir,

Your obedient Servant,

B. WAYMOUTH, *Secretary.*

No. 689.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

6th December, 1888.

SURVEY OF ENGINES AND BOILERS.

DEAR SIR,

You will doubtless remember that when the late Underwriters' Registry for Iron Vessels was united with this Society's Register, it was agreed that vessels holding a class in the former Registry should be entitled to the publication of this class in future issues of Lloyd's Register Book, so long as their Owners complied with the Rules of the Underwriters' Registry, 1884-5, relating to periodical surveys.

Prior to the two Registers being united, it was contemplated by the Committee of the Underwriters' Registry to appoint Engineer Surveyors to survey the Engines and Boilers of vessels classed in that Registry.

Although, as you are aware, that proposal was not carried out, and Owners of Steam Vessels classed in the late Underwriters' Registry were consequently not liable to such a requirement, some Owners have nevertheless had the Engines and Boilers of their vessels surveyed, and the surveys have afterwards been noted in Lloyd's Register Book.

Under these circumstances, I am directed to intimate that the Committee are quite prepared to give instructions to the Society's Surveyors to survey the Engines and Boilers of the steamer hereunder named, and in the event of their being found, or put into, good condition, to make a notification to that effect in the Register Book.

It is not necessary to point out the advantages of survey by an independent body, but the Committee venture to think that now this subject is brought to your notice you will possibly come to the conclusion that it is to your interest to avail yourself of such a safeguard.

I am, Dear Sir,

Your obedient Servant,

B. WAYMOUTH, *Secretary.*

N.B.—The following notations are used to denote that the engines and boilers of steam vessels have been inspected by this Society's Engineer Surveyors, and have been found or put into efficient condition, viz. :—

LMC.—Machinery certified by Lloyd's Register.

B&MS.—Boilers and Machinery surveyed and reported to be satisfactory by the Engineer Surveyors to Lloyd's Register.

✠ Special Survey of Machinery or Boilers during construction (thus ✠LMC. ✠NE&B).

No. 834.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

2, White Lion Court, Cornhill, E.C.

14th January, 1892.

SURVEY OF ENGINES AND BOILERS.

DEAR SIR,

On the 6th December, 1888, the Committee of this Society, in a circular letter which is reprinted on the other side, suggested to owners of steam vessels holding a class assigned by the late Underwriters' Registry for Iron vessels that they would do well to submit the machinery and boilers of their vessels to the inspection of the Society's Engineer Surveyors.

Although some owners have seen fit to act upon this suggestion there are many vessels still sailing, the engines and boilers of which have never been surveyed by independent Surveyors, and the Committee therefore think it right again to draw the attention of owners of such vessels to the desirableness of having the engines inspected and certified to by this Society's officers.

I am, Dear Sir,

Yours faithfully,

A. G. DRYHURST,
Secretary.

CIRCULAR No. 701.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

STEEL USED IN REPAIRS TO SHIPS AND BOILERS.

SIR,—I am directed to request that you will inform repairers of vessels at your port that, in ordering steel to be used in the repairs of vessels classed in the Society's Register Book, they should stipulate for a Certificate to be furnished by the manufacturers, setting forth that the steel has been tested in accordance with the requirements of the Committee of this Society under the inspection of one of the Society's Surveyors.

I am, Sir,
Your obedient Servant,
B. WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
14th February, 1889.

CIRCULAR No. 705.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

STEEL VESSELS.

GENTLEMEN,—With reference to the question of the liability of vessels built of steel to deterioration from corrosion, I am directed to acquaint you that the Committee of this Society, who have had this subject under their notice, think it right to place the results of their experience in regard thereto before owners of this description of property.

It is found that, in cases where the surfaces of vessels built of steel have not been properly scaled in the first instance and then protected with paint of good quality, the material is liable to great deterioration from corrosion, particularly in that portion exposed to the action of salt water. The Committee have no doubt that, with this information in your possession, you will see the desirability of taking the precaution of having new steel vessels belonging to you placed in dry dock and examined, within six months from the date of launching, so that, if symptoms of corrosion are found, the bottom may be properly scaled and coated.

I am also directed to point out the importance of having the inside and outside surfaces of steel vessels kept free from scale, and properly painted.

I am, Gentlemen,
Your obedient Servant,
B. WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
7th March, 1889.

CIRCULAR No. 716.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
24th July, 1889.

PATENT CEMENTS.

SIR,

With reference to the list, with which you are furnished, of vessels coated with Asphalt or Patent Cement, I am directed to draw your attention to the desirability of this description of coating being thoroughly cleaned out, when Portland Cement is to be substituted for it.

I am Sir,
Your obedient servant,
B. WAYMOUTH, *Secretary.*

CIRCULAR No. 722.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
1st September, 1889.

PETROLEUM VESSELS.

SIR,

With reference to the testing of the tanks of vessels intended to carry oil, I have to acquaint you that the Committee are of opinion that such tanks should be capable of withstanding a pressure of a head of water 15 feet above the crown of the tank, which would be equal to a pressure of 6lbs. per square inch.

I am, Sir,
Your obedient Servant,
B. WAYMOUTH, *Secretary.*

No. 726.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

EXPIRATION OF CHARACTER OF SHIPS CLASSED A, A IN RED, AND Æ.

NOTICE IS HEREBY GIVEN, that in pursuance of the Rules, Section 59 (as set forth below), and of a Resolution passed this day by the Committee of Lloyd's Register of British and Foreign Shipping :—

"All Ships classed A for a term of years, will, at the expiration of such term, or so soon after as may be practicable, have the word '*expired*' inserted against their names in the Register Book, and, if not surveyed and re-classed prior to the reprinting of the Register Book for issue in July next, will appear therein without character."

The foregoing Resolution will likewise apply to Ships classed A in Red, and Æ, whose period of exemption from special re-survey will terminate on the 31st December.

By order of the Committee,
BERNARD WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
7th November, 1889.

EXTRACT FROM THE RULES, SECTION 59.

"At the termination of the several periods assigned to Ships for remaining on the Character A or A in Red, they will have the word '*expired*' inserted against them; and if not surveyed prior to the reprinting of the Register Book, they will appear without any character."*

* The terms of years assigned to Ships on the character A launched *previously to the 1st July, 1859*, also of Ships launched during the *first* six months of the years 1860, 1861, 1862, and 1863, will expire on the 31st December of the last year of the periods assigned to them respectively.

The terms assigned to Ships launched during the *last* six months of the years 1859, 1860, 1861, and 1862, will expire on the 30th June next after the last year of the periods assigned to them respectively.

In the case of Ships launched on and after the 1st July, 1863, the period originally assigned to them on the A character will in every case *date from the month* in which the vessel may be launched, and will expire at the end of the corresponding month in the year at which the period assigned terminates.

No. 727.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING

SHIPS CLASSED A IN RED OR Æ.

The Rules, Sections 60 and 61, requiring that Ships classed A in red, or Æ, shall be surveyed *annually*, or on their return from every foreign voyage.

NOTICE IS HEREBY GIVEN, that in accordance with the above Rules, and in pursuance of a Resolution passed this day by the Committee, the Characters of Ships classed A in Red, or Æ, which shall not have been surveyed since the year 1887, will be omitted in reprinting the Register Book for issue in July, 1890.

By order of the Committee,
BERNARD WAYMOUTH,
Secretary.

2, White Lion Court, Cornhill, London, E.C.
7th November, 1889.

N.B.—In the case of Ships which it shall be made to appear by letter addressed to the Secretary, have not been in any Port in the United Kingdom since 1887, the above Resolution will not be applied.

CIRCULAR No. 737.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.
30th December, 1889.

COPPER STEAM PIPES.

GENTLEMEN,

I am directed by the Committee of this Society to bring under your notice the particulars of the bursting of a copper steam pipe which have recently been reported to them by the Society's Chief Engineer Surveyor.

The pipe in question formed one of the branch bends of the main steam pipes of a new Atlantic steamer : its internal diameter was 8 inches, its thickness, ·272 of an inch, or No. 2 W.G., and it was made by one of the most eminent firms of coppersmiths in the Kingdom, with a brazed joint in the usual manner.

Before being placed in the ship this pipe was tested by hydraulic pressure to 320lbs. per square inch, or twice the working pressure, on three different occasions, with satisfactory results. Nevertheless when bolted in its place, and while being subjected to a hydraulic test, for the purpose of proving that all the joints were tight, it gave way at a pressure of 310lbs. per square inch, and tore for a length of 20 inches near to the brazing, the material at the point of fracture presenting the appearance of having been partially cracked during the operation of brazing.

From tensile tests cut from the pipe in the vicinity of the fracture, and also away from the injured part, it was ascertained that the material had a tenacity of 33,000lbs., showing that the copper was of good quality, and taking the dimensions of the pipe into consideration it should have been capable of resisting a pressure of about 2,200lbs. per square inch before giving way ; the fact of its failing at a pressure of 310lbs. per square inch is of so alarming a character that the Committee think it right to suggest that it is deserving of your serious consideration.

In consequence of accidents having occurred with brazed pipes, some Engineers have adopted solid drawn pipes, others have hooped them, while others have lapped them with wire, but these are quite exceptional cases, and the Committee do not think it desirable at present to go further in this matter than to place the facts that have come under their notice in connection with such cases before those who are interested in the subject.

You will remember that the Committee drew your attention some little time since to the circumstance of a calamitous accident that happened on the s.s. "Elbe," of an exactly similar nature to this one.

I am, Gentlemen,
Your obedient Servant,
B. WAYMOUTH, *Secretary.*

NOTICE No. 745.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

The following firms having applied to have the steel produced by them tested by a Surveyor to this Society and their mode of procedure reported upon, their applications have been complied with and the Surveyors' reports found satisfactory by the Committee.

FIRMS IN THE UNITED KINGDOM.

Barrow Hæmatite Steel Co. (Lim.), Barrow.
W. Beardmore & Co., Rolling Mills and Steel Works, Parkhead, Glasgow.
Bolckow, Vaughan & Co. (Lim.), Middlesbro'-on-Tees.
Bolton Iron & Steel Co. (Lim.), Bolton, Lancashire.
Bowling Iron Co. (Lim.), Bradford, Yorks.
John Brown & Co. (Lim.), Sheffield.
Brymbo (The) Steel & Ingot Iron Works, near Wrexham. (*For bars only.*)
Butterley Co. (Lim.), Codnor Park, near Alfreton.
Calderbank Steel & Coal Co. (Lim.), Calderbank.
Charles Cammell & Co. (Lim.), Sheffield.
Clydebridge Steel Co., Rolling Mills and Steel Works, Cambuslang.
Clydesdale, A. & J. Stewart and, Rolling Mills and Steel Works, Mossend.
Coltness Iron Co. (Lim.), Melting Furnace and Foundry, Newmains, Lanarkshire.
David Colville & Sons, Rolling Mills and Steel Works (Dalzell Steel and Iron Works), Motherwell
Consett Iron Co. (Lim.), Blackhill, Durham.
Dorman, Long & Co., (Lim.), Middlesbro'-on-Tees.
Dowlais Iron Works Co., Dowlais.
Dumbarton Steel Co., Rolling Mills, Dalreoch, Dumbarton.
Frodingham Iron & Steel Co., Frodingham, near Doncaster. (*Sections and Bars.*)
Glasgow Iron & Steel Co. (Lim.), Melting Furnaces at Wishaw, and Rolling Mills at Wishaw and Motherwell. (*For plates not exceeding half-an-inch.*)
Goodwins, Jardine & Co. (Lim.), Rolling Mills & Steel Works at Coatbridge, & Foundry at Ardrossan.
Hardie & Gordan, Melting Furnaces and Foundry at Dalreoch, Dumbarton.
P. R. Jackson & Co. (Lim.), Salford Rolling Mills, Manchester.
Lanarkshire Steel Co. (Lim.), Motherwell. (*Bars only.*)
Leeds Forge Co. (Lim.), Leeds.
Moor Steel & Iron Co. (Lim.), Stockton-on-Tees.
Nettlefolds (Lim.), Castle Works, Tydu, near Newport, Mon. (*Rivet and Stay bars.*)
New British (The) Iron Co., Corngreaves, near Birmingham.
Palmers' Shipbuilding & Iron Co. (Lim.), Jarrow-on-Tyne.
Park Gate Iron & Steel Co. (Lim.), Rotherham.
Patent (The) Nut & Bolt Co. (Lim.), near Birmingham. (*For rivet bars only.*)
Patent Shaft & Axletree Co. (Lim.), Wednesbury.
Snedshill Iron Co. (Lim.), Shifnal, Shropshire. (*For plates not exceeding half-an-inch.*)
John Spencer, Phœnix Iron & Steel Works. Rolling Mills at Coatbridge, and Melting Furnaces [at Drumpellier.
John Spencer & Sons, (Lim.), Newburn Steel Works, Newcastle-on-Tyne.
Springfield Steel Co., Melting Furnace and Foundry, 777, London Road, Glasgow.
Steel Company of Scotland (Lim.), Rolling Mills and Steel Works at Newton and Blochairn.
Steel, Peech & Tozer, (Lim.), Sheffield. (*Rivet and Stay bars.*)
Stockton Malleable Iron Co. (Lim.), Stockton-on-Tees.
Summerlee & Mossend Iron & Steel Co., Rolling Mills and Steel Works at Mossend.
Taylor Bros., Leeds.
Wear Steel Co. (Lim.), Sunderland.
Weardale Iron & Coal Co. (Lim.), Spennymoor.
West Cumberland Iron & Steel Co. (Lim.), Workington.
West Hartlepool Steel & Iron Co., W. Hartlepool.
Wigan Coal & Iron Co. (Lim.), Wigan. (*Sections and Bars.*)

FIRMS ON THE CONTINENT.

Aciéries Hauts-Fourneaux & Forges de Trignac, near St. Nazaire.
Angleur Steel Works, near Liège.
Avesta Steel Works, near Stockholm.
Société John Cockerill, Seraing, near Liège.
Degerfors Steel Works, Sweden.
Donawitz Iron & Steel Works, near Leoben.
Duisberger Eisen und Stahlwerke, Duisberg.
The Espérance Rolling Mills, Longdoz, Liège.
Gewerkschaft Grillo, Funke & Co., Schalke, Westfalen.
Gute Hoffnungs Hütte, Oberhausen.
Hörde Steel Works, near Dortmund.
Innerberger Haupt-gewerkschaft.
The Jemeppe Rolling Mills, near Liège.
Kladno Steel Works, Kladno, near Prague.
Kohlswa Jernverks Aktiebolag. Melting Furnaces and Foundry at Kohlswa, Sweden.

(Revised March, 1894.)

Krainische Industrie Gesellschaft, of Assling, Oberkrain.
Krupp's Steel Works at Annen.
Do. do. Essen.
Motala Company, Sweden.
Neuberg Steel Works, Neuberg, Styria.
Oberbilker Stahlwerk, Dusseldorf. Melting Furnaces, Dusseldorf; Rolling Mills at "Dusseldorfer Rohren and Eisen—Walzwerke."
The Phœnix Company at Eschweiler.
Schneider & Co., Creusot.
Société Anonyme d'Ougrée, near Liège.
Société Anonyme de la Providence, Hautmont, North of France.
Società Ligure Metallurgia (Lim.), Sestri Ponente, Italy.
Tardy & Beneck, Savona.
The Union Iron & Steel Co., Dortmund, Germany.
Witkowitz Steel Works, Witkowitz, Mohren.

CIRCULAR No. 756.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, London, E.C.
13th March, 1890.

THE ELECTRIC LIGHTING OF VESSELS.

SIR,

The attention of the Committee of this Society has been drawn to the circumstance that in vessels lighted with electricity, fires have occurred through defects in fittings or in the insulation of the wires.

As such accidents are of great importance to all concerned in the safety of Vessels, the Committee are very desirous of obtaining the fullest and best information possible respecting the use of the electric light for lighting Vessels.

I am directed, therefore, to address you on the subject and to intimate that the Committee will feel much obliged to you for any remarks and suggestions with which you may kindly favour them with regard both to methods of installation and also to the most satisfactory means of maintaining the insulation of wires and fittings unimpaired, so as to eliminate as far as practicable the risk of fire which at present appears to attend the use of the electric light.

I am, Sir,
Your obedient Servant,
B. WAYMOUTH,
Secretary.

25th September, 1890.

(See also Notice 886*).*

CIRCULAR, No. 773. (*To Surveyors.*)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
14th August, 1890.

DOUBLING PLATES IN BOILERS.

SIR,

The attention of the Committee has been drawn to the case of a boiler in which the lower parts of the combustion chambers, instead of having been constructed in the usual manner of one plate of sufficient thickness, was made of a comparatively thin plate strengthened by a doubling plate, with the result that the inner plating became bulged and boiler rendered leaky.

In view of the above I am directed to draw your attention to the necessity of seeing that no doubling plates are fitted in any boiler in positions where they are exposed to the action of the heat of the fires. In such positions the necessary strength should be provided for, if possible, by using a single plate of sufficient thickness, or, where this is impracticable the plates should be strengthened by stays or by ⌊ or ⊥ bars.

I am, Sir,
Your obedient Servant,
B. WAYMOUTH,
Secretary.

CIRCULAR, No. 778. (*To Surveyors.*)

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
19th August, 1890.

COPPER STEAM PIPES.

SIR,

I am directed, for your information and guidance, to bring to your knowledge the following particulars of the failure of a main copper steam pipe while being tested by hydraulic pressure.

The pipe in question was 7 feet long by 7½ inches diameter and was made of sheet copper ·284 inch thick. The copper was rolled and the edges bevelled and brazed in the usual manner.

It appears that the pipe when first inspected and tested was found unsatisfactory along the line of brazing, the overlapping or joint in some places being open, so that the Surveyor could insert his tester about half an inch.

The joint was rebrazed at these open places and the hydraulic test again applied to 320lbs., which was the test pressure required by the rules (viz. twice the working pressure, which is 160lbs.). The pipe withstood this pressure, but as the Surveyor did not feel quite satisfied with the general appearance of the rebrazed parts, he recommended that the pressure be put higher. While this was being done, one of the rebrazed parts commenced at once to show symptoms of weakness, and at 500lbs. pressure per square inch (which is 340lbs. above the steam pressure) the pipe gave way at that place and opened out for a length of 7 inches.

Three samples were cut from the pipe, near to the place where it gave out, one longitudinally, one transverse and one across the brazed joint. The tensile tests of the two former were 15 tons each, and the latter 12 tons per square inch. The results of these tests show that the copper was of good quality, and had the brazed joint been perfectly made throughout, the bursting pressure of it would have been over 2,000lbs. per square inch instead of 500lbs. The bevelled edges of the copper plate, where the pipe gave way, were bevelled too far back and not sufficiently overlapped, thereby considerably reducing the thickness of the copper at that part, which was torn through the solid metal and not the brazing.

In the Surveyor's opinion the bursting of the pipe at 500lbs. was due to the development of a small flaw in the copper, which most probably arose from overheating whilst the pipe was being rebrazed at that part.

The Committee having this case before them consider that the Surveyors should at all times make a most thorough inspection of copper steam pipes when under test, especially along and near the line of brazing.

I am, Sir,
Your obedient Servant,
B. WAYMOUTH,
Secretary.

NOTICE No. 782.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE IS HEREBY GIVEN: that the requirements for the second and subsequent Special Surveys No. 3, as set forth in the Rules for Iron Vessels, and in the Rules for Steel Vessels, have this day been amended to read as follows:—

1. The Vessel must be submitted to the same survey as before described for *Survey No.* 3, with the following additions:—

2. The condition of the scantlings must be ascertained, the shell plating to be drilled at such parts as the Surveyors may consider necessary to satisfy themselves as to its thickness, the number of holes on each side in no case being less than the number of strakes of plating not covered with cement in the vessel.

3. Care should be taken especially to ascertain the extent of deterioration of steamers in way of the side bunkers and boilers.

4. A sketch showing the thickness at the parts where drilled is to accompany the report on the vessel, for the consideration of the Committee.

5. The plating in way of cement in the bottom need not be drilled, provided the cement be found to be adhering satisfactorily to the plating, and the Surveyors consider drilling unnecessary.

By order of the Committee,
B. WAYMOUTH,
Secretary.

2, *White Lion Court, Cornhill, London, E.C.,*
25th September, 1890.

CIRCULAR, No. 801.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.
22nd December, 1890.

REVISION OF FEES.

SIR,

I am directed to acquaint you that the General Committee have determined to make the following revisions in the established scale of Fees, Sections 27 and 29 of the Rules, and to request that you will be governed by this intimation in future, viz. :—

SECTION 27, PART I.

Entry Fee for *s.s.* No. 3 on Iron Ships—*to be remitted.*

Entry Fee for Continuation, Restoration, and Red A Surveys on Wood and Composite Vessels—*to be remitted.*

PART II. (A and B.)

Office or Registration Fee.—*In cases where surveys are held on the hulls and machinery of vessels, this fee is to be charged only on one of the surveys.*

SECTION 29.

Certificates of Classification—*charge to be remitted.*

I have to point out that the preparation of Certificates entails considerable work in the Society's General Office and that it is not proposed to issue these documents on Surveyors' reports unless it be made clear that Owners or their Agents have specially requested them.

In the case, however, of vessels, particularly sailing vessels, that are proceeding on long voyages, say, to the Australian Colonies, it is considered that you might suggest to Masters that they may find it convenient to be furnished with a Certificate.

I am Sir,

Your obedient Servant,

A. G. DRYHURST,
Assistant Secretary.

No. 851.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ANCHORS AND CABLES.

NOTICE IS HEREBY GIVEN that the notation of LA&CP (**Lloyd's Anchors and Chains Proved**) is made in the Society's Register Book in the case of Vessels, the **Anchors** and **Chains** of which have been tested at Proving Establishments under the control of the COMMITTEE of LLOYD'S REGISTER OF SHIPPING.

The following establishments are under the control of the Committee :—

Lloyd's Proving House, TIPTON (Staffordshire)	*Superintendent*	Mr. E. R. Isitt.
	Assistant „	Mr. H. Green.
Lloyd's Proving House, NETHERTON (nr. Dudley)	„	Mr. D. G. Lewis.
	Assistant „	Mr. G. Horspool.
Lloyd's Proving House, LOW-WALKER-ON-TYNE	„	Mr. C. E. Perrins.
Lloyd's Proving House, CHESTER (Saltney)	„	Mr. A. S. Jack.
	Assistant „	Mr. J. Littler.
Lloyd's Proving House, GLASGOW	„	Mr. E. Seedhouse.
Lloyd's Proving House, CARDIFF	„	Mr. G. W. Penn.

The notation of A&CP will, as heretofore, be recorded in respect to Anchors and Chain Cables tested at the Sunderland Public Proving Machines.

By order of the Committee,

A. G. DRYHURST,

Secretary.

2, WHITE LION COURT, CORNHILL, E.C.

September, 1892.

CIRCULAR No. 831.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court, Cornhill, London, E.C.*

30*th November*, 1891.

OIL-CARRYING VESSELS.

SIR,

I am directed to send for your information results, which the Committee consider may be found useful, of the experience gained by the Officers of this Society respecting the effects on the hulls of some vessels constructed for the purpose of carrying oil in bulk when some of their tanks have been used for carrying water ballast.

It has been found that, in ballasting such vessels with water, the consecutive tanks in some cases have not been run up, and, by thus leaving empty spaces in the main body of the vessel, undue strains have been brought upon the structure at these parts, leading to considerable damage to the vessel.

In other cases, sufficient care has not been taken to ensure that the tanks have been quite filled, and kept filled; and a deep empty tank has even sometimes been run up at sea whilst the vessel was encountering heavy weather. By these means, great strains and damage have been caused from masses of free water being brought against the bulkheads, &c., internally.

It should be borne in mind that carrying liquid in bulk, independently of the nature of the cargo, causes considerably more straining on the plating and riveting of vessels than would occur in carrying general cargo. In the former instance the weight of the cargo is brought only on the outside plating,

whereas with general cargo a great portion of the strain is borne by the floors, frames, keelsons, stringers, &c. Great precaution is therefore necessary in oil-carrying vessels to prevent the strains, which are necessarily exceptional, from being materially intensified by the action within the vessel of large quantities of moving oil or water.

It may not be out of place to remark that provision, as regards the trim of the vessel, should be made so that the consecutive tanks in the midship part can be quite filled. These spaces should be sub-divided, particularly at the fore end, to such an extent that the trim of the vessel will admit of the tanks being quite filled, without the statutory depth of loading being exceeded.

Experience has also shown that danger arises from not filling the water spaces at the end of the stokehold with water so as to prevent oil finding its way into the coal bunkers and saturating the coals.

I am, Sir,

Your obedient servant,

A. G. DRYHURST, *Secretary.*

CIRCULAR No. 832.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court, Cornhill, E.C.*

7th December, 1891.

FEEDERS IN GRAIN-LADEN VESSELS.

SIR,

I am instructed to draw your attention to a case that has recently occurred, in which a grain-laden steamer capsized owing to the giving way of the feeders in the 'tween decks, and a large portion of the grain contained in them being thrown towards one side of the vessel.

In the case in question, the lower holds were completely filled with grain in bulk and the hatchways were utilized as feeders, formed of planks round the hatchways. Additional feeders were also provided at the sides of the vessel extending from the main to the upper deck.

From investigations made by the Officers of this Society it has been found that, as compared with similar vessels loaded in the same manner, the vessel in question had both considerable initial stability, due to her comparatively large metacentric height, and also a good range of stability, due to her large freeboard. There is no reason, therefore, to conclude that the accident was in any way due to an inherent want of stability.

The heeling of the vessel, however, caused by the grain from the feeders being thrown on one side, conduced to the cargo gradually settling down on the depressed side and thus continuously increasing the angle of the heel, until capsizing occurred.

Under these circumstances, it is considered useful to draw the attention of Shipowners to the fact that although feeders are a source of safety in grain laden vessels, in providing for the holds being kept full on the grain settling down, yet if they be not efficiently constructed, and properly shored at the sides and ends, they may lead to danger, as instanced in the case referred to.

I am, Sir,

Your obedient servant,

A. G. DRYHURST, *Secretary.*

CIRCULAR No. 847.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,

23rd June, 1892.

SIR,

With reference to the cases of vessels in which the steel or iron decks required by the Society's Rules are not carried continuously throughout the length of the vessels, I am directed to acquaint you for your guidance, that in vessels having a raised quarter connected to a bridge house, and requiring by Table S 5 more than one iron or steel deck, the bridge house should extend over not less than the half length amidships, to comply practically with this requirement.

I am, Sir,
Your obedient servant,
A. G. DRYHURST,
Secretary.

CIRCULAR No. 852.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,

27th September, 1892.

SIR,

It having recently come to the knowledge of the Committee that, in some vessels where Pitch Pine decks have been fitted, damage to cargo has resulted from leakage, owing to the shrinking of the decks, and to rents and shakes, I am directed to inform you that, in cases where it is intended to fit the weather decks of Pitch Pine in vessels classed, or intended for classification in the Society's Register Book, you are to take steps to ensure that the decks have been well seasoned after being cut.

Special attention should also be directed to the laying of decks of this material and to the caulking of the seams and rents.

I am, Sir,
Your obedient servant,
A. G. DRYHURST,
Secretary.

CIRCULAR No. 862.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
29th November, 1892.

ADVICE OF STEEL TESTS, &c.

SIR,

The Committee have recently had before them a case in which steel that had been rejected by the Society's Surveyors at the Steel Works was delivered at the Shipyard and was being worked into a vessel intended for classification in the Society's Register Book. I am therefore directed to remind you that the Surveyors at the Shipyards and Boiler Works are required to compare the Advice Notes forwarded to them from the Steel Works with the material delivered for use in vessels or boilers to be built under their survey; and they should compare the same with the material at the *earliest possible stage*, in order to prevent material being used which has not been duly passed and advised by the Surveyors at the Steel Works.

The Local Ship and Engineer Surveyors should impress upon the Shipbuilders and Boilermakers the necessity of requiring properly signed Advice Notes to be produced at the time of delivery, for all material supplied to them, and should also arrange for the Advice Notes to be kept duly filed at the Shipyards and Boiler Works, and to be always accessible for reference.

The Surveyors at Steel Works will be held responsible for seeing that, in all cases where material fails to withstand the prescribed tests, the brands approved by the Committee and stamped on the plates, beams, or angles are defaced by punch marks, as required by the Rules, and the Surveyors must satisfy themselves as to the manner in which the rejected material is being disposed of.

I have to remind you that the requirements of Section 3, paragraph 8, of the Rules for Steel Ships are intended to apply equally to the Steel for Boilers, viz.:—

"The Society's Surveyor will require to have every facility placed in his way for tracing all plates, beams, and angles to their respective charges, and to be furnished with two copies of the advice notes of the material, one of which, when he shall have been satisfied with the results of the tests applied to the material, he is to sign, to be forwarded by the Manufacturers to the Shipbuilders, and the other of which is to be forwarded by him to the Society's Surveyors at the port where the vessel is to be built."

All tests made by the Surveyors should be duly entered in the Official Test Books, in order that there may be a permanent record which will enable the Surveyors at any time to furnish all necessary details in the event of such being required. These books, when filled up, should be retained in the office.

The Surveyors at the Steel Works will be held responsible for the prompt despatch of the Advice Notes and a memorandum of the despatch must be made in the Test Books, and the date of receipt should be stamped or written on the Advice Notes at the local office.

I have to add that in all important cases in which the material tested does not satisfy the requirements of the Rules, full particulars of the same should be submitted for the information of the Committee.

I am, Sir,

Your obedient servant,

A. G. DRYHURST,

Secretary.

CIRCULAR No. 866.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

16th December, 1892.

DEAR SIRS,

With reference to the Committee's Circular Letter, dated the 19th May, 1892, I am directed to remind you that the weights required by Table 22 of this Society's Rules for Anchors and Chain Cables of vessels intended to be classed with the figure "1" in the Register Book, are *minimum* weights, and to state that, as this Rule has now been so long in operation, the Committee will not, unless under very exceptional circumstances, be prepared, in cases where the weights supplied are less than the minimum required by Table 22, to assign the vessels the figure "1" in the Society's Register Book.

I am, Dear Sirs, your obedient servant,

A. G. DRYHURST, *Secretary.*

CIRCULAR, No. 872.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

6th February, 1893.

SIR,

The Committee's attention has been drawn to the following points, to which your notice is specially directed :—

(1) As regards laying of Ceiling on Tank tops.

It will be your duty to see that the requirements of the Rules, Section 24, Paragraph 6, are in all cases carried out; at the same time, the battens, on which the ceiling is laid, should be placed athwartships, in order that water may the more readily find its way into the bilges. The battens should not be less than about one inch in thickness. In order, likewise, to prevent grain, etc., finding its way between the ceiling planks, care should be taken, when a vessel comes under survey, to see that the edges of the ceiling fit close to each other.

(2) Tank, Air, and Sounding Pipes at the Deck.

In some instances, leakage has taken place at the connection of the pipes at the decks. The accompanying sketch, shewing the proposed arrangements for the connection of the pipes, is herewith sent for your information.

(3) Stokehold and Engine Room Bulkheads.

Your attention is specially directed to the Circular No. 774, on this subject, issued in August, 1890, with a view to preventing fires in coal bunkers, and the recommendations embodied in that Circular should be brought under the notice of Shipbuilders in cases where deviations from the same are intended to be made.

(4) Test Plugs in Air Pipes.

In cases where holes are cut in air pipes for the purpose of testing water ballast tanks, care should be taken that properly tapped bolts are subsequently fitted in these holes.

I am, Sir, your obedient servant,

A. G. DRYHURST, *Secretary.*

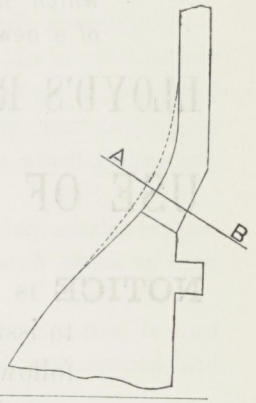
CIRCULAR No. 873.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

6th February, 1893.

RUDDER FRAMES.



SIR,—The attention of the Committee having been drawn to some cases where the moulding of the rudder frame immediately above the upper pintle, as shown at section A B, has been unduly reduced, I am directed to request that you will bring this matter under the notice of the Shipbuilders in your district, with a view to the rudder frames being made of a more satisfactory form at this part, as indicated by the dotted line when the upper pintle is fitted in the position shown on the accompanying drawing.

I am, Sir, your obedient servant,

A. G. DRYHURST,

Secretary.

CIRCULAR No. 880.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.

HAND PUMPS.

20th April, 1893.

SIR,—I am directed to call your attention to the fact that, in some cases, the hand pumps fitted to vessels classed in the Register Book have been found useless because of the depth from the lower part of the chamber to the suction rose exceeding 24 feet—the limit which, experience shows, should not be exceeded when ordinary hand pumps are fitted.

You are, therefore, to see, in all vessels building under your survey, that the hand pumps are properly tested to ensure that water can be pumped from the limbers.

In all cases of new vessels, and of vessels undergoing Special Surveys Nos. 1, 2, and 3, you should satisfy yourselves before recommending them for the Figure 1 that all pumps, sluice valves, and watertight doors are in efficient working order, and should state on the reports that these matters have been attended to.

I am, Sir, our obedient servant,

A. G. DRYHURST, *Secretary.*

CIRCULAR No. 885.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, London, E.C.

25th May, 1893.

HEADS OF STOCKLESS ANCHORS.

SIR,—With reference to the footnote to Table No. 22 which provides that "the heads of Stockless Anchors should not be less than three-fifths of the total weight of the anchor," I am directed to request that, in future, when issuing certificates of drop test, you will insert thereon the weight of the heads of the Anchors as ascertained when the anchors are weighed at the time the percussive and bend tests are applied.

I am, Sir, your obedient servant,

A. G. DRYHURST, *Secretary.*

NOTICE No. 886.

This Notice is intended to take the place of No. 783 and No. 870, the suggestions in which have been amended as regards Section 4, paragraph 8, and the addition of a new paragraph (No. 2) Section 7.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

USE OF ELECTRIC LIGHT ON BOARD VESSELS.

NOTICE IS HEREBY GIVEN: that the Committee of this Society have determined to issue, as suggestions, for the consideration of Shipowners, and others, the following proposals relating to the use of the electric light on board vessels, viz.:—

(1.) **POSITION OF DYNAMOS AND OF ELECTRIC MOTORS.**—Dynamos and Electric Motors should be placed as far as possible from all compasses, and should be at least 30 feet from the standard compass.

(2.) **CABLES.**—In vessels fitted with continuous current dynamos, and wired on the single-wire system, no single cable should be carried within 15 feet of any compass, and cables conveying a heavy current should be fixed at still greater distance. If it is necessary to fix the cables within this distance, then for all parts of the vessel lighted from this cable the double-wire system should be adopted, the return wire being carried as near the flow as possible in the vicinity of the compasses.

(3.) **ADJUSTMENT OF COMPASSES.**—The compasses should be adjusted with the dynamo not working, after which the vessel's head should be put upon the different courses, with the dynamo running at full speed, and on each course the indications of the compass should be noted with the dynamo running with open circuit and with all possible combinations of the current switched "on" and "off" all circuits passing near the compasses. These indications should be compared with those obtained with the dynamo stopped, and any serious deflections of the compasses remedied before the vessel sails. In vessels wired on the "double-wire" system this is not so important as in those wired on the "single-wire" system, but at least the effect should be tested of the dynamo running with open circuit.

(4.) **LEADS OR CIRCUITS.**—1. The copper used in all leads should have a conductivity of at least 98 per cent. that of pure copper, and the sectional area should be at least in the proportion of one square inch per 1,000 ampères carried.

2. No single wire of less than 16 standard wire gauge should be used. For portable leads stranded cables composed of smaller wires may be used.

3. The insulation resistance of all wires should be not less than 600 megohms per statute mile, after 24 hours' immersion in sea water.

4. If india-rubber insulation is used, the wires should be first covered with a layer of pure rubber, then with a separator, then with a layer of vulcanizing india-rubber, and then with a layer of

india-rubber coated tape. The whole should then be vulcanized together. The cable should afterwards be satisfactorily protected, preferably with a braided covering of tarred fibre.

5. Wires which are insulated with any other material than india-rubber should fulfil the same conditions as to insulation resistance, and should be of equal durability with those above specified.

6. The leads should be placed where they can always be accessible; if they are laid in wood battens the covers should be screwed on, not nailed, and care should be taken that the casings are impervious to moisture. If the leads are not encased they should be secured by screwed clips, not staples, but unprotected leads should only be used where it is impossible to enclose them. Cables which are properly covered with protective metal sheathing may, however, be unencased.

7. All cables which are liable to be exposed to moisture, more especially when they are also exposed to heat, should be lead covered, or be otherwise specially protected. This refers to such places as open alleyways, near galleys, oil lamps, boiler casings, engine room, &c.

8. All cables led through cargo spaces, coal bunkers, *or spaces which may at any time be used for carrying cargo or baggage, or which are not at all times accessible*, should be lead covered and further protected by wrought iron casings, or be led through metal tubes.

9. Where cables pass through beams, or bulkheads, they should be led through special fittings of hard wood to prevent their being chafed, and where they pass through decks they should be led through metal tubes lined with wood, or fibre, and securely fastened to the decks, standing at least six inches above the deck level.

10. In vessels having spaces allotted alternately for passengers and cargo, the lamp fittings in these spaces should be portable, and the terminals so arranged that they can be properly covered up with insulating covers. The switches and cut-outs should be outside these spaces and should be fitted so that they are under lock and key.

(5). **JOINTS IN LEADS.**—1. Joints in main leads should be avoided if possible. If joints cannot be avoided in the main leads they should, after the wire is carefully jointed, soldered and insulated, be encased in a satisfactory watertight junction box. If the cables are lead covered, perfectly sound lead soldered junctions should be made over the joints.

2. Joints in branches, or of branches with main leads, should have the copper wires thoroughly soldered; the insulation should be carefully carried out and all the joints should be made watertight. Joints in flow and return wires should not be made opposite one another.

3. For soldering wires, resin only should be used as a flux.

(6).—**JOINTS WITH HULL.**—In vessels fitted on the single-wire system, all the joints with the hull should be in accessible positions. They should be made with brass screws not less than three-eights of an inch in diameter, carefully tapped into the steel, having white brass washers, between the wires and steel, or the wires should be soldered to brass faced washers.

(7).—**SWITCHES AND CUT-OUTS.**—1. A main switchboard should be fitted in the dynamo room, to which all the main circuits throughout the ship should be brought, a switch and cut-out being fitted for each circuit. If auxiliary switchboards for further sub-division of the current are necessary, they should be placed in conveniently accessible positions, and each small circuit should be fitted with a separate switch and cut-out.

2. *In cases where electric lights are used for the mast-head light and side lights, the switches controlling these lights should be placed in a position where they can be controlled by the Officer of the watch, or other responsible person, and cannot be tampered with by other members of the crew, or by passengers, &c.*

3. The switches should be mounted on slate or other uninflammable bases, and should be so constructed that they must be either full "on" or completely "off," that is, they must not be able to remain in an intermediate position. They should have ample rubbing surfaces and their conductivity should not be less than that of the wires connected to them.

4. Cut-outs should be fitted to the circuit as near as possible to each of the dynamo terminals, and also to each circuit as near as possible to the switches of these circuits.

5. All cut-outs should be in easily accessible places. They should be mounted on slate or other uninflammable bases and be arranged so that the fused metal may not be a source of danger. They should also have non-inflammable covers.

6. The fuses should be of non-oxidizable metal, and should be so proportioned as to melt with a current 50 per cent. in excess of the normal current, that is they should melt with a current in the proportion of 1,500 ampères per square inch of section of the wires they protect. The main fuses are preferably to be subdivided into small wires instead of using one large wire.

7. In vessels wired on the double-wire plan cut-outs should be fitted to each wire.

(8). **TESTS, &c.**—1. On completion of an electric lighting installation on board a vessel, the insulation of all the circuits should be tested before the trial run has been made, and after a trial of six hours' duration with all the lights in circuit, and should fulfil the following conditions :—

2. The insulation resistance over the whole installation should not be below the following :—

Installations of	25	lights	 500,000	Ohms.
„	50	„	 250,000	„
„	100	„	 125,000	„
„	500	„	 25,000	„
„	1,000	„	 12,500	„

3. When the lights are between the above numbers then the insulation resistance should be correspondingly proportionate.

4. The insulation resistance of the separate circuits of the installation should also be in accordance with the above tables.

5. For alternating currents the minimum insulation resistance should be twice that given in above table.

6. A voltmeter and an ampère meter should be supplied with each installation.

(9.) **IN VESSELS CARRYING PETROLEUM.**—All switches and cut-outs should be fitted in places not liable to the accumulation of petroleum vapour or gas, and all lamps in places where it is possible for gas to accumulate should be made with an outer glass globe hermetically sealed. All wires in such places should be lead covered, or the insulation of the cables employed should be of such a nature as not to be affected by petroleum.

By order of the Committee,

2, White Lion Court, Cornhill, London, E.C.,
11th May, 1893.

A. G. DRYHURST,
Secretary.

NOTICE NO. 890.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

REMISSION OF FEES.

NOTICE IS HEREBY GIVEN that the General Committee have, at a Special Meeting, held this day, determined to **abolish**

All Fees chargeable for the Survey of Repairs, whether of Damage or of any other nature, by the Society's Exclusive Surveyors in the United Kingdom,

and to **reduce**

Fees charged for Special Surveys and Reports of Damage.

By order of the Committee,

2, WHITE LION COURT, CORNHILL, E.C.
8th June, 1893.

A. G. DRYHURST,
Secretary.

NOTICE NO. 894.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

Record of drp, srp, and lrp.

NOTICE IS HEREBY GIVEN that, in accordance with a recent resolution of the Committee, when a vessel passes any Special Periodical Survey as prescribed by the Rules, all previous notations of "drp" (damage repairs), "srp" (some repairs), and "lrp" (large repairs) will be expunged if they have been in the Register Book for one year; also when Special Periodical Surveys and Repairs take place simultaneously the records of "drp," "srp," and "lrp" will remain for one year only.

By order of the Committee,

2, WHITE LION COURT, CORNHILL, E.C.
14th June, 1393.

A. G. DRYHURST,
Secretary.

NOTICE NO. 895.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RECORD OF TEAK DECKS IN THE REGISTER BOOK.

NOTICE IS HEREBY GIVEN that in any case in which the working weather deck of vessels classed under the Two or Three Deck Rule, or Spar Deck or Awning Deck Rules, is of teak, the Committee will be prepared to record the fact in the Society's Register Book (thus "Deck Teak"), upon receiving a request to that effect from the owners, and subject to the deck being examined by the Society's Surveyors, and found to be in good condition.

In the case of a vessel having a bridge house, the deck in the alleyways must in order to render her eligible for the above notation, be of teak, but it is not required that in such cases the Poop, Bridge, and Topgallant Forecastle decks, shall be of East India Teak.

By order of the Committee,

2, WHITE LION COURT, CORNHILL, E.C.
2nd November, 1893.

A. G. DRYHURST,
Secretary.

NOTICE No. 898.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE IS HEREBY GIVEN THAT THE FOLLOWING ALTERATIONS AND AMENDMENTS HAVE BEEN MADE BY THE GENERAL COMMITTEE IN THE RULES OF THE SOCIETY FOR IRON AND FOR STEEL VESSELS.*

Section 24.—DOUBLE BOTTOMS (PEAKS).

The following paragraph 5 has been added, pages 37 and 114 (present paragraph 5 to 30 will now be 6 to 31) :—

"A wash plate to be fitted in the peaks when used for water ballast, and the tank to be subjected to the test of a head of water of 8 feet above the crown, but not less in any case than the height of the load water line."

Section 15.—PILLARS.

The first three lines of the first paragraph, pages 27 and 103, have been amended to read as follow :—

All beams *the length of which exceeds one half that of the midship upper deck beams to be pillared where practicable. Where pillars are required to the upper deck beams the pillaring must be completed down to the keelson. The pillars to the coamings of hatchways should not exceed* 4 *frame spaces apart on each side, and all hatchways* 26 *feet in length and above are to be pillared at the corners;* in addition, the beams under the deck houses, &c., to the end of the paragraph.

The third paragraph, pages 27 and 104, has been amended as follows :—

The word "*three-fourths*" substituted for "half" in the second line of paragraph, and the words "*in the 'tween decks*" added after the word "fitted" at the end of the fifth line of this paragraph.

The following paragraph 4 has been added, pages 27 and 104 (and the present paragraphs 4 to 10 will now be 5 to 11) :—

"Quarter pillars to be of the diameter given in Tables G 1 and S 1 for hold and deck pillars."

* These alterations and amendments are now embodied in the Rules for 1894–95.

HEIGHT OF ENGINE AND BOILER CASINGS IN PARTIAL AWNING DECKED AND AWNING DECKED VESSELS.

Section 29.—ENGINE AND BOILER OPENINGS.

Paragraph 1, pages 43 and 120, has been amended by inserting the following after the word "deck" in the fourth line :—

> "*Except in Awning and Partial Awning deck vessels where the height of the casing need not exceed* 4 *feet* 6 *inches above the deck, provided suitable iron covers be fitted, and the openings have coamings on the top of the casings not less than* 9 *inches in height;* the thickness of the same, &c., to the end of paragraph."

Section 23 and Special Surveys.—WOOD DECKS.

The following amendments have been made in this Section.

Paragraph 10, pages 36 and 113, and Special Survey No. 1, paragraph 5, pages 9 and 83, S.S. No. 2, paragraph 7, pages 10 and 84, and S.S. No. 3, paragraph 5, pages 11 and 85 :—

> "When a deck, originally required to be 4 inches thick is worn to 3 inches; $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches; and 3 inches to $2\frac{1}{2}$ inches, *it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.*"

The first sentence of paragraph 15, pages 36 and 113, has been amended to read as follows :—

> "*If a wood flat be laid over an Iron or Steel upper deck, the thickness should not be less than* 3 *inches if of Pine and* $2\frac{1}{2}$ *inches if of Teak*, and it should be efficiently secured between the beams to the deck plating."

The following paragraph 16, pages 36 and 113, has been added :—

> "In all cases Iron or Steel decks, whether sheathed or not, are required to be caulked."

OREGON PINE FOR DECK PLANKS.

The following paragraph 3 has been added to **Section 23**, pages 36 and 113 :—

> "Oregon pine of good quality will be admitted for decks of vessels, provided it be laid with the grain vertical, and the width of planks and period of seasoning be as required for Pitch Pine."

RUDDER HEADS AND PINTLES.

The following has been added to **Section 36** (Rudders), paragraph 1, after the second sentence, pages 45 and 122, viz. :—

> "In cases where the rudder is exceptionally large, or where the vessel is built to attain a high speed, the diameter of the rudder head should be increased beyond that given in Tables G 3 and S 3."

"It is also recommended that the stops on the steam steering engines should be fitted at a smaller angle than the stops on the rudder, in order to prevent excessive strain through the rudder being forced against the stops."

The following paragraph 16 has been added to **Section 42** (Spar deck vessels) pages 50 and 127, viz. :—

"The diameters of Rudder Heads and Pintles to be regulated by the number which regulates the plating of a three deck vessel of the same dimensions."

TABLES G 6 and S 6.—DOUBLING OF SHEERSTRAKES.

These Tables have been amended.

The amendment provides that in the cases of large vessels of extreme proportions the doubling of the sheerstrake should be extended to its extreme upper edge instead of being fitted below stringers only ; in such cases the words "below stringer" have been omitted in the Table.

The following footnote has been added to Tables G 6 and S 6, viz. :—

"In lieu of the doubling plates required above, the thickness of the sheerstrake, the strake next below the sheerstrake, and the upper deck stringer plate may be increased in thickness to afford equivalent strength. In vessels where the plating number is over 28,000, and double butt straps are not required by Section 20, paragraph 8, such straps are to be fitted to the butts of the sheerstrake."

Table 10.—TOPMASTS.

The following paragraph has been added after the third note on Table 10 :—

"When the length of the topmasts exceeds 46 feet, efficient cheek plates are to be fitted to the same."

By order of the Committee,

A. G. DRYHURST,

Secretary.

2, White Lion Court, Cornhill, London, E.C.,

14th December, 1893.

NOTICE No. 903.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE IS HEREBY GIVEN THAT THE FOLLOWING ALTERATIONS AND AMENDMENTS HAVE BEEN MADE BY THE GENERAL COMMITTEE IN THE RULES OF THE SOCIETY FOR IRON AND FOR STEEL VESSELS, AND THAT THEY WILL TAKE EFFECT AT THE EXPIRATION OF SIX MONTHS FROM THE DATE OF THIS NOTICE.

Section 3.—QUALITY OF STEEL (for Shipbuilding purposes).—TESTS.

The following amendment has been made in the Rules for Steel Vessels, paragraph 10, page 88, in the third line, after the words "16 per cent." insert "*in plates $\frac{5}{20}$ and less in thickness, and 20 per cent. in plates of greater thickness.*"

Section 19.—(Bulwark Stanchions for Sailing Vessels of 1,800 tons and above.)

The second clause of paragraph 12, pages 31 and 108, in the fourth line has been amended to read as follows :—

"In no case are the stanchions which support the bulwarks to be more than 6 feet apart, *and in sailing vessels of 1,800 tons and above, the spacing is not to exceed 4 to 5 feet apart; the heel of each stanchion to be attached by not less than four $\frac{7}{8}$ inch bolts, tapped through the stringer plate, and secured with a nut and grummet.*"

and to substitute the following for the last clause :—

"Other forms of stanchions may be adopted, provided they are submitted for approval."

Section 23.—DECKS (Gutter Waterway Angle Bars).

The following paragraph 6 has been added to this Section, page 112 :—

"When gutter waterways are adopted at the upper deck, the angle bar forming the inner edge of waterways is not to be less in thickness than

"$\frac{10}{20}$ where the thickness of the deck is 4 inches
"$\frac{9}{20}$ " " " " $3\frac{1}{2}$ inches
"$\frac{8}{20}$ " " " " 3 inches."

Section 24.—CEILING ON TOP OF DOUBLE BOTTOMS.

The sixth paragraph of this Section, pages 38 and 114, has been amended as follows :—

"The upper side of the plating must be protected with wood ceiling $2\frac{1}{2}$ inches thick, and laid on battens $1\frac{1}{2}$ inches thick, to admit of drainage water passing to the wells, *unless the ceiling be laid on the top of the inner bottom, embedded in a substantial covering such as Stockholm tar and cement.*"

Section 27.—COCKS, VALVES, AND SOIL PIPES. (Pages 41 and 118.)
(Sluice Valves on Watertight Bulkheads.)

This Section has been amended to read as follows :—

"1. No sluice valve or cock is to be fitted to the collision bulkhead.

"2. No sluice valves or cocks are to be fitted to the engine room, or other watertight bulkheads, unless they are arranged so as to be at all times accessible.

"3. If the after peak is used as a ballast tank, no sluice valve or cock is to be fitted to the after bulkhead ; but if it is not so used, and if no pump is fitted in it, a sluice valve or cock is to be fitted to the after bulkhead, to allow water to reach the pumps when required.

"4. When sluice valves are fitted, they are to be so arranged as to be controlled above the Load Water Line, and the rods are to be boxed in to prevent injury."

The second paragraph referring to the sea cocks in connection with the Engines and Boilers to be omitted from this Section, as the requirements of this paragraph are completely provided for in the Rules for Machinery.

Paragraphs 3, 4 and 5 to be made 5, 6 and 7 and to remain as at present.

Section 36.—RUDDERS.

The second paragraph of this Section, pages 45 and 122, has been amended to read as follows :—

"Solid cast Steel rudders of approved manufacture, and satisfactorily tested, will be admitted if the particulars be in the first instance submitted to and approved by the Committee. *Where single plate rudders are adopted, the plate to be of the thickness given in Tables S 3 and G 3, and an arm to be fitted in way of each pintle, with an intermediate arm between ; the arms being fitted alternately on opposite sides of the plate.*"

TABLES S 3 and G 3.

The headings of the 9th and 11th columns of Tables S 3 and G 3 have been amended to read "Diameter of Pintles," and two new columns added, giving the section of the main piece at the heel ; also a new column giving the thickness of Single plate rudders.

The following footnote has also been added to Tables S 3 and G 3 to provide the necessary sectional area of rudder posts at heel when single plate rudders are adopted :—

"*In cases of single plate rudders, the sectional area of main piece at heel to be one-third greater than given in the above Table.*"

(*See accompanying Tables.*)

RUDDER HEADS for Steam Vessels.

The following footnote has been added to Tables S 3 and G 3

"The diameters of rudder heads to be calculated by the following formula, b no case is the diameter to be less than that given in Tables S 3 and G 3 :—

$$\text{"d} = \tfrac{1}{32} \sqrt[3]{\mathbf{D} \times \mathbf{B}^2 \times \mathbf{S}^2}$$

"where **D** = feet draught, **B** = breadth of rudder in inches, and **S** = speed in knots."

(*See accompanying Tables.*)

The following to be omitted from amendment to **Section 36** (Rudders), given in Notice No. dated 14th December, 1893 :—

"In cases where the rudder is exceptionally large, or where the vessel is built to at a high speed, the diameter of the rudder head should be increased beyond that given Tables G 3 and S 3."

TABLES S 4 and G 4—BEAMS.

The scantlings required for beams have been extended, as shown on the accompanying Tables.

By order of the Committee,

A. G. DRYHURST,

Secretar

2, White Lion Court, Cornhill, London, E.C.,

5th April, 1894.

Section 24.—CEILING ON TOP OF DOUBLE BOTTOMS.

The sixth paragraph of this Section, pages 38 and 114, has been amended as follows :—

"The upper side of the plating must be protected with wood ceiling $2\frac{1}{2}$ inches thick, and laid on battens $1\frac{1}{2}$ inches thick, to admit of drainage water passing to the wells, *unless the ceiling be laid on the top of the inner bottom, embedded in a substantial covering such as Stockholm tar and cement.*"

Section 27.—COCKS, VALVES, AND SOIL PIPES. (Pages 41 and 118.)
(Sluice Valves on Watertight Bulkheads.)

This Section has been amended to read as follows :—

"1. No sluice valve or cock is to be fitted to the collision bulkhead.

"2. No sluice valves or cocks are to be fitted to the engine room, or other watertight bulkheads, unless they are arranged so as to be at all times accessible.

"3. If the after peak is used as a ballast tank, no sluice valve or cock is to be fitted to the after bulkhead ; but if it is not so used, and if no pump is fitted in it, a sluice valve or cock is to be fitted to the after bulkhead, to allow water to reach the pumps when required.

"4. When sluice valves are fitted, they are to be so arranged as to be controlled above the Load Water Line, and the rods are to be boxed in to prevent injury."

The second paragraph referring to the sea cocks in connection with the Engines and Boilers to be omitted from this Section, as the requirements of this paragraph are completely provided for in the Rules for Machinery.

Paragraphs 3, 4 and 5 to be made 5, 6 and 7 and to remain as at present.

Section 36.—RUDDERS.

The second paragraph of this Section, pages 45 and 122, has been amended to read as follows :—

"Solid cast Steel rudders of approved manufacture, and satisfactorily tested, will be admitted if the particulars be in the first instance submitted to and approved by the Committee. *Where single plate rudders are adopted, the plate to be of the thickness given in Tables S 3 and G 3, and an arm to be fitted in way of each pintle, with an intermediate arm between ; the arms being fitted alternately on opposite sides of the plate.*"

TABLES S 3 and G 3.

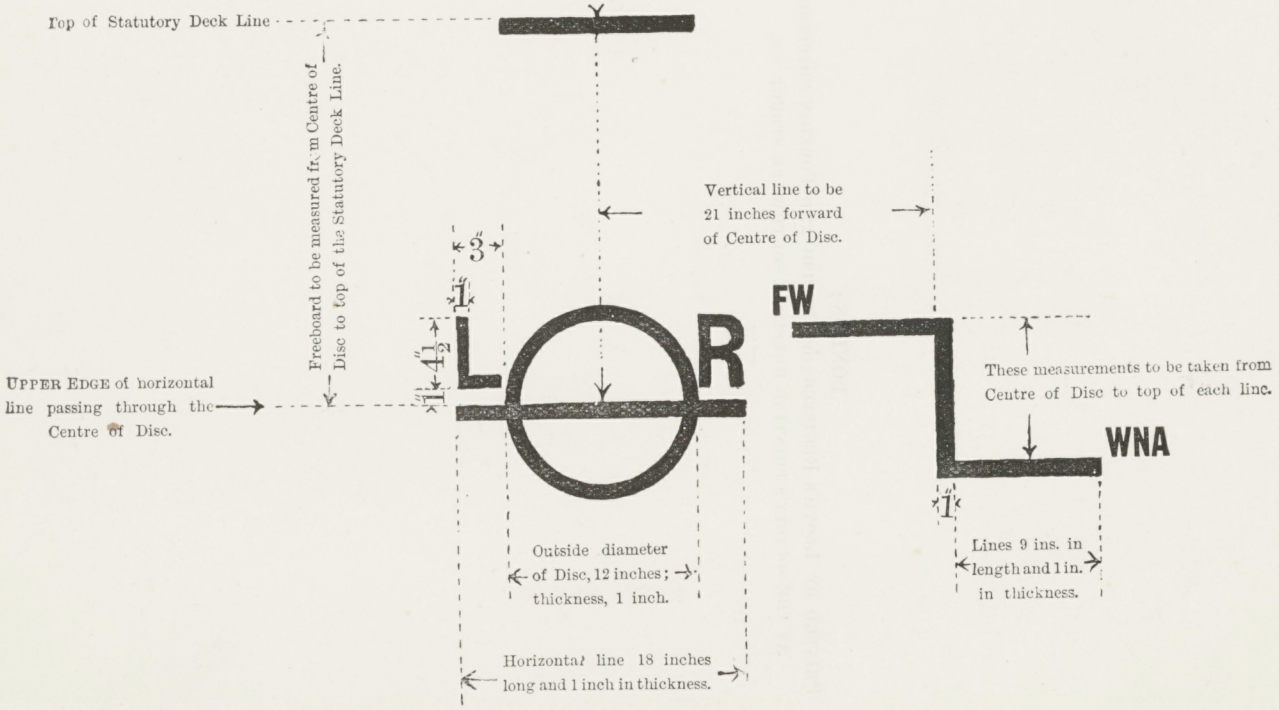
The headings of the 9th and 11th columns of Tables S 3 and G 3 have been amended to read "Diameter of Pintles," and two new columns added, giving the section of the main piece at the heel ; also a new column giving the thickness of Single plate rudders.

The following footnote has also been added to Tables S 3 and G 3 to provide the necessary sectional area of rudder posts at heel when single plate rudders are adopted :—

"*In cases of single plate rudders, the sectional area of main piece at heel to be one-third greater than given in the above Table.*"

(*See accompanying Tables.*)

FREEBOARD MARKING FOR SAILING VESSELS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load line. Coasting vessels are required to be marke with only the maximum load line in fresh water. In accordance with the regulations made by the Board of Trade, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in the Certificate are to be entered in the official log.

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